



ABSTRACT BOOK

The 14th National Science Research Conference
Science for future

25 - 26 May 2023

School of Science University of Phayao





การประชุมวิชาการระดับชาติ"วิทยาศาสตร์วิจัย" ครั้งที่ 14

สาส์นจากนายกสมาคมวิทยาศาสตร์แห่งประเทศไทย ในพระบรมราชูปถัมภ์

ในนามของสมาคมวิทยาศาสตร์แห่งประเทศไทย ในพระบรมราชูปถัมภ์ ผมมีความยินดีเป็นอย่างยิ่งที่ได้มีโอกาสเป็นเจ้าภาพร่วมกับเครือข่ายที่ประชุมคณบดีคณะวิทยาศาสตร์ ของมหาวิทยาลัยในเครือเทงามทั้ง 6 มหาวิทยาลัย ในการจัดการประชุมวิชาการระดับชาติ "วิทยาศาสตร์วิจัย" ครั้งที่ 14 ระหว่างวันที่ 25-26 พฤษภาคม 2566 ณ มหาวิทยาลัยพะเยา และถือโอกาสนี้ต้อนรับผู้เข้าร่วมการประชุมในครั้งนี้

ขอแสดงความยินดีในความสำเร็จของการจัดการประชุมครั้งนี้ ขอขอบคุณประธานกรรมการและกรรมการ ประธานอนุกรรมการและอนุกรรมการฝ่ายต่างๆ โดยเฉพาะอย่างยิ่งฝ่ายวิชาการ ที่ทำหน้าที่อย่างเต็มที่ หายนี้หวังว่าผู้เข้าร่วมการประชุมได้แลกเปลี่ยนความรู้และสร้างองค์ความรู้ที่ทันสมัยและมีประโยชน์ในวงการวิชาการของ วิทยาศาสตร์ เทคโนโลยีและนวัตกรรมต่อไป

รองศาสตราจารย์ดร.ธัญญ์คุณ มงคลอัครวัฒน์

นายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์



การประชุมวิชาการระดับชาติ"วิทยาศาสตร์วิจัย" ครั้งที่ 14

สาส์นจากคณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยพะเยา และประธานคณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ

การประชุมวิชาการระดับชาติ “วิทยาศาสตร์วิจัย” ครั้งที่ 14 ในระหว่างวันที่ 25-26 พฤษภาคม 2566 ณ มหาวิทยาลัยพะเยา โดยมี สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์ คณะวิทยาศาสตร์ มหาวิทยาลัยในเครือเทา-งาม 6 มหาวิทยาลัย คือมหาวิทยาลัยศรีนครินทรวิโรฒ มหาวิทยาลัยนเรศวร มหาวิทยาลัยบูรพา มหาวิทยาลัยมหาสารคาม มหาวิทยาลัยทักษิณ และมหาวิทยาลัยพะเยา ได้ร่วมกันเป็นเจ้าภาพ จัดขึ้นที่มหาวิทยาลัยพะเยา จังหวัดพะเยา เพื่อให้ นักวิจัย นักวิทยาศาสตร์ อาจารย์ นิสิต นักศึกษาและผู้สนใจเข้าร่วมเสนอผลงาน รับฟังแนวคิดการวิจัย นวัตกรรม และการทำวิจัยมีเครือข่ายร่วมกัน ในศาสตร์ของวิทยาศาสตร์เทคโนโลยี ตลอดจนการประยุกต์ ก่อให้เกิดประโยชน์ต่อชุมชน องค์กร และการพัฒนาประเทศให้ก้าวไกลต่อไป

กระผมในฐานะประธานที่ประชุมคณบดีมหาวิทยาลัยศรีนครินทรวิโรฒและการประชุมวิชาการระดับชาติ “วิทยาศาสตร์วิจัย” ครั้งที่ 14 ขอขอบคุณผู้เข้าร่วมประชุม ผู้นำเสนอผลงาน วิทยากรคณะกรรมการผู้ตัดสิน แขกผู้มีเกียรติทุกท่านตลอดจนเจ้าภาพทุกสถาบัน และผู้ปฏิบัติงานที่มีส่วนร่วมในการประชุม ทำให้การประชุมในครั้งนี้ มีบรรยากาศที่น่าประทับใจและสำเร็จลุล่วงเป็นอย่างดี

กระผมขอให้การประชุมวิทยาศาสตร์วิจัยครั้งที่ 14 นี้ บรรลุตามวัตถุประสงค์ที่วางไว้ และมีการร่วมมือในการวิจัย มีเครือข่ายกว้างขวาง มีการก้าวหน้าเป็นการประชุมที่ยิ่งใหญ่ขึ้น และพัฒนาเป็นการประชุมวิชาการระดับนานาชาติมีมาตรฐานสูงในอนาคตอันใกล้

รศ.ดร.ชยันต์ บุญยรักษ์

คณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยพะเยา
ประธานคณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ

Oral Presentation

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง
วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์
เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยีทางอาหาร

BIO-O1 – BIO-O92

1-92

กลุ่มที่ 2 สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม

CHEM-O1 – CHEM-O17

93-109

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์ สาขาวิชาสถิติ

MATH-O1 - MATH-O25

110-134

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา และคณิตศาสตร์ศึกษา

EDU-O1 – EDUO14

135-148

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์ เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

COM-O1 – COM-O15

149-163

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

PHY-O1 -PHY-O35

164-198

กลุ่มที่ 7 สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์

INNO-O1 – INNO-O5

199-203

กลุ่มที่ 8 Routine to Research

R2R-O1 – R2R-O3

204-206

Poster Presentation

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง
วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์
เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยีทางอาหาร

BIO-P1 – BIO-P80 207-286

กลุ่มที่ 2 สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม

CHEM-P1 – CHEM-P39 287-325

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์ สาขาวิชาสถิติ

MATH-P1 - MATH-P7 326-332

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา และคณิตศาสตร์ศึกษา

EDU-P1 – EDU-P7 333-344

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์ เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

COM-P1 – COM-P5 345-344

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

PHY-P1 -PHY-P29 345-373

กลุ่มที่ 7 สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์

INNO-P1 – INNO-P10 374-383

กลุ่มที่ 8 Routine to Research

R2R-P1 – R2R-P8 384-391

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุฬาลงกรณ์มหาวิทยาลัย วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยีทางการเกษตร

เวลา 13.30-14.00 น.

Chairperson: รองศาสตราจารย์ ดร.สิทธิศักดิ์ ปิ่นมณฑลกุล มหาวิทยาลัยพะเยา

Invited speaker: รองศาสตราจารย์ ดร.สุปราณี แก้วภิมย์ คณะวิทยาศาสตร์ มหาวิทยาลัยบูรพา

บรรยายในหัวข้อ: BCG Product commercialization : Lessons learned

ห้อง: CE05202 อาคาร: อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปาง ธรรมปถวิญญู)

เวลา 14.15-17.00 น. **แยกนำเสนอผลงานแบบบรรยายตามห้อง**

Session (Room)	Time																																		
	14.15-14.30	14.30-14.45	14.45-15.00	15.00-15.15	15.15-15.30	15.30-15.45	15.45-16.00	16.00-16.15	16.15-16.30	16.30-16.45	16.45-17.00																								
Session 1 (CE05202)	BIO-O1	BIO-O2	BIO-O3	BIO-O4	BIO-O5	*ผู้นำเสนอขอเข้าไป Upload file ทุก 15 นาที																													
Session 2 (CE05302)	BIO-O10	BIO-O11	BIO-O12	BIO-O13																															
Session 3 (CE05303)	BIO-O19	BIO-O20	BIO-O21	BIO-O22	BIO-O23																														
Session 4 (CE05304)	BIO-O29	BIO-O30	BIO-O31	BIO-O32	BIO-O33																														
Session 5 (CE05402)	BIO-O39	BIO-O40	BIO-O41	BIO-O42																															
Session 6 (CE05403)	BIO-O48	BIO-O49	BIO-O50	BIO-O51	BIO-O52																														
Session 7 (CE05404)	BIO-O58	BIO-O59	BIO-O60	BIO-O61																															
			BIO-O6	BIO-O7	BIO-O8	BIO-O9	BIO-O14	BIO-O15	BIO-O16	BIO-O17	BIO-O18	BIO-O24	BIO-O25	BIO-O26	BIO-O27	BIO-O28	BIO-O34	BIO-O35	BIO-O36	BIO-O37	BIO-O38	BIO-O43	BIO-O44	BIO-O45	BIO-O46	BIO-O47	BIO-O53	BIO-O54	BIO-O55	BIO-O56	BIO-O62	BIO-O63	BIO-O64	BIO-O65	BIO-O66

Parallel Sessions 1 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE05202

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.วาสนา พิทักษ์พล มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.สิริวัฒน์ บุญชัยศรี มหาวิทยาลัยพะเยา

Committee 2: ดร.ภาวินี จันทร์วิจิตร มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O1	The study on growth and biomass of Khao Dawk Mali 105 and RD6: case study of non-irrigated paddy field, San Khong sub-district, Dok Kham Tai district, Phayao province	ตุลยวัต ต๊ะเวียง
2	14.30-14.45 น.	BIO-O2	Preliminary yield trial evaluation of waxy corn hybrids in Phayao	สุริยศักดิ์ อุ่นตาล
3	14.45-15.00 น.	BIO-O3	Advance yield trial of maize hybrids integrating of public Institutes in Phayao and Lampang	เจนจิรา ถ้ำกลาง
4	15.00-15.15 น.	BIO-O4	Preliminary yield trial of field maize hybrids in Phayao Province	Yuong Vorn
5	15.15-15.30 น.	BIO-O5	Effects of the light types on growth and yield quality of cherry tomato cultivars sweet girl	จีระศักดิ์ มีรอด
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 1 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.45 น. ห้อง CE05202

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.วาสนา พิทักษ์พล มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.สิริวัฒน์ บุญชัยศรี มหาวิทยาลัยพะเยา

Committee 2: ดร.ภาวินี จันทร์วิจิตร มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O6	Evaluation of salinity-induced progressive leaf temperature changes in RD6 and salt-tolerant RD6 rice seedlings using a simple thermal imaging technique	ชลธิชา พรหมดวง
2	16.00-16.15 น.	BIO-O7	Evaluating physiological responses of newly improved RD6 rice with introgressed <i>Saltol</i> QTL to salinity stress	สุพิชชา นະที
3	16.15-16.30 น.	BIO-O8	Exogenous silicon alleviates some salt stress damage in KDML105 rice seedlings	วงศกรณ์ วงศ์ลา
4	16.30-16.45 น.	BIO-O9	A study on the effect of daily light integral on growth of Asiatic pennywort (<i>Centella asiatica</i> L.) grown in closed system	ภาสินี สกุลมเมษา

Parallel Sessions 2 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE05302

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.สุภฎา ศิริรัฐนิคม มหาวิทยาลัยทักษิณ

Committee 1: รองศาสตราจารย์ ดร.ดุจฤดี ปานพรหมมินทร์ มหาวิทยาลัยพะเยา

Committee 2: ดร.วนิดา อภิธนาพงศ์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O10	The production of flathead lobster (<i>Thenus orientalis</i> (Lund, 1793)) in close system with smart farm	กฤษณ์ ไชยวงศ์
2	14.30-14.45 น.	BIO-O11	Effect of supplementation of <i>Centella asiatica</i> crude extract in giant freshwater prawn diets on growth performance, immune system and gut microbiome	ดลยา ปิ่นม่วง
3	14.45-15.00 น.	BIO-O12	Effect of thermal stress on physiological response of barnacles in Si Chang Island, Chonburi Province	กมลลักษณ์ ดีอุดม
4	15.00-15.15 น.	BIO-O13	Chronic exposure of simvastatin disrupts histology and protein profile of the hooded oyster (<i>Saccostrea cucullata</i>)	จิราภรณ์ ตาสันเทียะ
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 2 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05302

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.สุภฎา ศิริรัฐนิคม มหาวิทยาลัยทักษิณ

Committee 1: รองศาสตราจารย์ ดร.ดุจฤดี ปานพรหมมินทร์ มหาวิทยาลัยพะเยา

Committee 2: ดร.วนิดา อภิธนาพงศ์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O14	Effect of yeast autolysate on the productivity and immune status in lactating sows	เพชร ชัยเสนา
2	16.00-16.15 น.	BIO-O15	Effects of crude palm oil supplementation on egg production performance, eggs quality, and blood serum lipid profile in laying hen	อภิสิทธิ์ องศาธา
3	16.15-16.30 น.	BIO-O16	The effect of the emulsifier supplementation in diets on performance, carcass quality, and apparent metabolizable energy (AME) of broiler chickens	กษมา สุทธิลักษณ์
4	16.30-16.45 น.	BIO-O17	Effects of organic mineral supplementation in diet on growth performance and production cost in broiler chickens	ปิ่นทारीย์ วิเศษสิงห์
5	16.45-17.00 น.	BIO-O18	Effect of dietary supplementation of Habanero pepper powder on meat quality and growth performance of broiler chickens	ธนาธิป ทรัพย์เจริญกุล

Parallel Sessions 3 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE05303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.สมบูรณ์ อนันตลาโภชัย มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.นิรมล ปัญญาบุศยกุล มหาวิทยาลัยบูรพา

Committee 2: รองศาสตราจารย์ ดร. ภพแก้ว พุทธิรักษ์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O19	Comparison of <i>Acetobacter xylinum</i> culture medium from fruit juice in bioplastic production	จิรพัชร โชคสิริสรณ์
2	14.30-14.45 น.	BIO-O20	Effects of stress factors on cell survival and antioxidant production by thermotolerant yeast	ศุทธอร ตรงต่อกิจ
3	14.45-15.00 น.	BIO-O21	Comparison of optimal conditions for decomposition of polystyrene foam with <i>Pseudomonas</i> sp.	พิมพ์ชนก วงษ์นครินทร์
4	15.00-15.15 น.	BIO-O22	Effects of using spent mushroom substrate ensiled with whole-crop corn on rumen digestibility by <i>in vitro</i> technique	ณัฐธนิชชา ง้าวกาเขียว
5	15.15-15.30 น.	BIO-O23	Nutritional value and digestibility evaluation of Napier grass ensiled with spent mushroom substrate by <i>in vitro</i> technique	พัชรพร อิน้อย
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 3 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: รองศาสตราจารย์ ดร.สมบูรณ์ อนันตลาโภชัย มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.นิรมล ปัญญาบุศยกุล มหาวิทยาลัยบูรพา

Committee 2: ดร.กัณดา แสงวิจิตร มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O24	Effects of rice straw quality improvement by legumes on rumen fermentation and methane emission by <i>in vitro</i> technique using the DAISY ^{II} incubator	นงนภัส พุทธสาระพันธ์
2	16.00-16.15 น.	BIO-O25	Synthesis of silver nanowires using hydrothermal method and their antimicrobial applications	จารุวรรณ เทพศิริ
3	16.15-16.30 น.	BIO-O26	Remineralizing effects of nano-silver fluoride on artificial dentine caries in a biofilm-challenged environment (Pilot study: <i>In-Vitro</i> study)	พีรญาณันท์ พันธุ์เพ็ง
4	16.30-16.45 น.	BIO-O27	Antibacterial activity of giant African snails' mucus against <i>Staphylococcus aureus</i> and <i>Staphylococcus epidermidis</i>	ณัฐฐิณีสิริ พรหมานนท์
5	16.45-17.00 น.	BIO-O28	Antibacterial activity of mucus isolated from different sizes of the giant African snail (<i>Lissachatina fulica</i>)	พีรดา อยู่คอน

Parallel Sessions 4 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE05304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ดร.ลลิตา โชติพฤตพิงศ์ มหาวิทยาลัยบูรพา

Committee 1: ดร.ไผ่แดง ขวัญใจ มหาวิทยาลัยพะเยา

Committee 2: ดร.ธนพัฒน์ แพ่งเกษร มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O29	Physicochemical properties of protein isolate from soy sauce residue and antioxidant potential of pineapple peel extract	Long Chhovin
2	14.30-14.45 น.	BIO-O30	Antioxidant activities and polyphenol contents of <i>Bidens pilosa</i> L. leaf extracts	กานต์ธิดา ไชโย
3	14.45-15.00 น.	BIO-O31	Development of drinking Japanese sweet corn supplemented with inulin to add value of low-grade corn	ชนพัฒน์ มณีเทศ
4	15.00-15.15 น.	BIO-O32	Development of sugar-reduced spread from pomelo	ปิยะดา ล้อมปิติเรืองกิจ
5	15.15-15.30 น.	BIO-O33	Impact of extraction methods and solvents on antioxidant and anti-inflammatory activities of <i>Etlingera pavieana</i> rhizomes	จงกลณี ผดุงเกษม
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 4 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ดร.ลลิตา โชติพฤตพิงศ์ มหาวิทยาลัยบูรพา

Committee 1: ดร.ไผ่แดง ขวัญใจ มหาวิทยาลัยพะเยา

Committee 2: ดร.ธนพัฒน์ แพ่งเกษร มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O34	Efficiency of antibacterial activity from crude extract of <i>Cannabis sativa</i> subsp. <i>sativa</i>	ลักขณา มีแสง
2	16.00-16.15 น.	BIO-O35	Screening for antifungal activity of purified compounds from <i>Clausena harmandiana</i> on human pathogenic fungi	แพรวา จันทนะโพธิ
3	16.15-16.30 น.	BIO-O36	Antioxidant and antimicrobial activities of Sangyod rice sprout extract and utilization in jelly	ปาไลดา บุรีศรี
4	16.30-16.45 น.	BIO-O37	Vascular effect of lotus seed extract	ณัฐวรรชัย วันพุทธ
5	16.45-17.00 น.	BIO-O38	Antifungal activity of medicinal plants against dermatophytes	นันทิชา รจิตพุกษา

Parallel Sessions 5 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE05402

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.ประสาร อินทเจริญ มหาวิทยาลัยบูรพา

Committee 1: รองศาสตราจารย์ ดร.สิทธิศักดิ์ ปิ่นมงคลกุล มหาวิทยาลัยพะเยา

Committee 2: ดร.สุชัยญา ทองเครือ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O39	Ecological services of water yield and water flow control of the Kaeng Krachan forest complex	ธรรมบุญ เต็มไชย
2	14.30-14.45 น.	BIO-O40	Bird diversity and community composition in planted forests, Nan Province	แรกขวัญ ผลธัญญา
3	14.45-15.00 น.	BIO-O41	Preliminary field application of tea bag method for root decomposition study in an estuarine mangrove forest at Trat Province	นดา ยิ้มัสชา
4	15.00-15.15 น.	BIO-O42	A development AI application for identification of wild mushroom species on iOS operating system	ขวัญเรือน นาคสุวรรณกุล
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรอบถัดไป Upload file				

Parallel Sessions 5 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05402

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

- Chairperson: ผู้ช่วยศาสตราจารย์ ดร.ประสาร อินทเจริญ มหาวิทยาลัยบูรพา
 Committee 1: รองศาสตราจารย์ ดร.สิทธิศักดิ์ ปิ่นมงคลกุล มหาวิทยาลัยพะเยา
 Committee 2: ดร.สุชัยญา ทองเครือ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O43	The species composition and abundance of marine fish on artificial reef (Fish Dome) at Samae Sarn Island, Chon Buri Province	อศลย์ มีนาภา
2	16.00-16.15 น.	BIO-O44	Diversity of phototrophic euglenoid protozoa (Euglenozoa) related to water quality during the rainy season time period in Mae Moei reservoir, Mae Tha District, Lamphun Province	พิชญภาคิณ ไชยมงคล
3	16.15-16.30 น.	BIO-O45	The prediction of Eutrophication with factors of water quality and phytoplankton	วิชญา กั้นบัว
4	16.30-16.45 น.	BIO-O46	The application of an echo sounder to investigate the shoal of fish in the fish shelters at Samae San Island, Chonburi Province	ฉันทพร เทียนอุบล
5	16.45-17.00 น.	BIO-O47	Coastal bottom topography mapping using market grade side scan sonar	วิโรจน์ ละอองมณี

Parallel Sessions 6 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE05403

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.นุจิรา ทาทัน มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ธนาพร บุญมี มหาวิทยาลัยพะเยา

Committee 2: ดร.วิภาศิริ สุนทรชัย มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O48	DNA barcodes diversity of <i>Apis cerana</i> Fabricius, 1758 from apicultural and natural breeding area	รุจิรา จันทร์แดง
2	14.30-14.45 น.	BIO-O49	Genetic analysis of <i>Corbicula fluminea</i> (Müller, 1774) (Bivalvia, Corbiculidae) in native Southeast Asian range	ภูริช ภูตานนท์
3	14.45-15.00 น.	BIO-O50	Ecology and biodiversity studies of the big-headed turtle (<i>Platysternon megacephalum</i> Gray, 1831) using molecular technique for recovery plan and reintroduction population in Phu Sang National Park, Phayao Province	พิชชาภรณ์ อธิษฐ์โกคินโชค
4	15.00-15.15 น.	BIO-O51	Development of a biosensor assay for <i>Ascaridia galli</i> detection in chicken faeces using LAMP coupled with lateral flow technology	วศิน พาณิช
5	15.15-15.30 น.	BIO-O52	Epidemiological evaluation for gastrointestinal helminth infection in cattle from Surat Thani and Khon Kaen Provinces using microscopic and molecular based coprological examinations	สิรภัทร นาคอ่อน

พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file

Parallel Sessions 6 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05403

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.นุจิรา ทาทัน มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ธนาพร บุญมี มหาวิทยาลัยพะเยา

Committee 2: ดร.วิภาศิริ สุนทรชัย มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O53	Genetic variation of <i>Cyclocheilichthys enoplos</i> in the Mekong River, Nong Khai Province, Thailand	เบญจพรรณ เจริญยิ่ง
2	16.00-16.15 น.	BIO-O54	Cytogenetics of exotic fish species Red-Bellied Pacu <i>Piaractus brachypomus</i> (Cuvier, 1818) in Thailand	กัญญา อนุกุลชนากร
3	16.15-16.30 น.	BIO-O55	Constructed wetland with water hyacinths (<i>Eichhornia crassipes</i>) reduces the chromosomal aberration in the swamp eel (<i>Monopterus albus</i>)	ณัฐดา วรรณรส
4	16.30-16.45 น.	BIO-O56	Rapid DNA extraction from canine blood samples by polymerase chain reaction and recombinase polymerase amplification techniques	อภิสิทธิ์ เชื้อแก้ว
5	16.45-17.00 น.	BIO-O57	Cloning and sequence analysis of a novel leucine rich repeat (LRR) gene from <i>Streptococcus agalactiae</i>	รวิภา อุกฤษณ์อักษร

Parallel Sessions 7 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE05404

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.สุภาพร ภััสสร มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ชัชวิน เพชรเลิศ มหาวิทยาลัยบูรพา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.อรอำไพ จำภา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	BIO-O58	Dietary supplementation with <i>Cordyceps militaris</i> spent mushroom substrate extract and <i>Pediococcus acidilactici</i> TISTR 783 enhancing immune response and cytokine expression in Nile tilapia (<i>Oreochromis niloticus</i>)	กนกกาญจน์ ชูสงค์
2	14.30-14.45 น.	BIO-O59	Effects of <i>Andrographis paniculate</i> extract on hematological indices, lysozyme activity and cumulative mortality of hybrid catfish (<i>Clarias macrocephalus</i> × <i>C. gariepinus</i>) after <i>Aeromonas hydrophila</i> injection	Chitra Ear
3	14.45-15.00 น.	BIO-O60	Efficacy of coffee grounds for the elimination of <i>Ascaris suum</i> egg in sludge	ทัศน์พล เกิดสุข
4	15.00-15.15 น.	BIO-O61	Effect of solvents on anthocyanin extraction from the seed and seedling of Khao Kum Phayao (<i>Oryza sativa</i> var. <i>glutinosa</i>)	นันทวัฒน์ จิณะเสน
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 7 กลุ่มที่ 1

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-17.00 น. ห้อง CE05404

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.สุภาพร ภััสสร มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ชัชวิน เพชรเลิศ มหาวิทยาลัยบูรพา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.อรอำไพ จำภา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	BIO-O62	Effect of nitrogen sources of cordycepin production from <i>Cordyceps militalis</i>	วิชุดา กล้าเวช
2	16.00-16.15 น.	BIO-O63	Comparative biological activities of Zingiberaceae plants harvested in Eastern Thailand	สุกัญญา นรมมาตร
3	16.15-16.30 น.	BIO-O64	Study on microplastic in <i>Amphibalanus</i> sp., <i>Chthamalus</i> sp., and <i>Tetraclita</i> sp. in Chonburi Province, Thailand	อุทุมพร สถาปนเศรษฐ์
4	16.30-16.45 น.	BIO-O65	Microplastic contamination in commercial bivalves from a seafood market in Eastern of Thailand	พรจุจี ยงศิริ
5	16.45-17.00 น.	BIO-O66	Study on properties of natural water for ready biodegradability test according OECD 301F	มิรันตี ดีเจริญ

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 26 พฤษภาคม 2566

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุฬาลงกรณ์มหาวิทยาลัย
วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยีทางอาหาร

เวลา 9.30-12.00 น. แยกนำเสนอผลงานแบบบรรยายตามห้อง

Session (Room)	Time									
	9.30-9.45	9.45-10.00	10.00-10.15	10.15-10.30	10.30-10.45	10.45-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.00
Session 1 (CE05202)	BIO-O67	BIO-O68	BIO-O69	BIO-O70	BIO-O71					
Session 2 (CE05302)	BIO-O72	BIO-O73	BIO-O74	BIO-O75	BIO-O76	BIO-O77	BIO-O78			
Session 3 (CE05303)	BIO-O79	BIO-O80	BIO-O81	BIO-O82	BIO-O83					
Session 4 (CE05304)	BIO-O84	BIO-O85	BIO-O86	BIO-O87						
Session 5 (CE05402)	BIO-O88	BIO-O89	BIO-O90	BIO-O91	BIO-O92					

Parallel Sessions 1 กลุ่มที่ 1

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.45 น. ห้อง CE05202

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.อนุพันธ์ กงบังเกิด มหาวิทยาลัยนเรศวร

Committee 1: รองศาสตราจารย์ ดร.ภพแก้ว พุทธิรักษ์ มหาวิทยาลัยพะเยา

Committee 2: ดร.บวร คุณากรนุรักษ์ มหาวิทยาลัยนเรศวร

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	BIO-O67	Effects of Paclobutrazol on the growth of (<i>Thrixspermum</i> sp.) <i>in vitro</i>	ณัฐพิชญ์ เมืองก้อน
2	09.45-10.00 น.	BIO-O68	The effect of 6-benzylaminopurine and thidiazuron on <i>in vitro</i> propagation of <i>Kalanchoe beharensis</i> Drake	วิทยา ผาคำ
3	10.00-10.15 น.	BIO-O69	Study on suitable treatment containing 2,4-dichlorophenoxyacetic acid on callus induction from PSL-92147-1-2-4 and Leum Pua Glutinous Rice	ชุติมา หงษ์เจริญไทย
4	10.15-10.30 น.	BIO-O70	Ecology distribution and conservation status of wild orchid of <i>Pleione</i> genus in Thailand	นิรันดร์รัตน์ ป้อมอิม
5	10.30-10.45 น.	BIO-O71	Analysis of expression patterns of Brassinosteroid-responsive genes in <i>Arabidopsis</i> root using single-cell RNA sequencing dataset	ชนภรณ์ วงศ์คำ

Parallel Sessions 2 กลุ่มที่ 1

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-11.15 น. ห้อง CE05302

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.กฤษชัย พูลเจริญ มหาวิทยาลัยพะเยา

Committee 1: ดร.อัคนี ผิวหอม มหาวิทยาลัยทักษิณ

Committee 2: ดร.พัทธวรรณ ละโป้ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับ ที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	BIO-O72	siRNA-mediated knockdown against PD-L1 suppresses cell proliferation and influences apoptosis in MDA-MB-231 cells	Diomerl Edward Baldo
2	09.45-10.00 น.	BIO-O73	Content validity of the brief International Classification of Functioning, disability and health (ICF) core set for children and youth with cerebral palsy (Thai Version)	อารีรัตน์ ต๊ะต่องใจ
3	10.00-10.15 น.	BIO-O74	Factors associated with poor glycemic control among Akha patients with type 2 diabetes mellitus, Chiang Rai, Thailand: a hospital-based case-control study	ฟาติมา ยีหมาด
4	10.15-10.30 น.	BIO-O75	Factors associated with type 2 diabetes mellitus among new cases in Damnoen Saduak Hospital, Ratchaburi Province	พัชรินทร์ กลัดแป้น
5	10.30-10.45 น.	BIO-O76	Factors associated with hypertension among clients at Damnoen Saduak Hospital, Ratchaburi Province	พิมพ์พิสุทธิ์ ธรรมพิพัฒนกุล
6	10.45-11.00 น.	BIO-O77	Dentist's assessment of oral status, denture quality, oral health related quality of life, and their associations: A cross-sectional study in tooth-supported removable partial denture wearers	มณัญญา อัจฉริยพันธ์ุ
7	11.00-11.15 น.	BIO-O78	Comparative analysis of lifestyle and physical activity among medical and health sciences students in Vietnam during and after the COVID-19 pandemic	Tam Ho

Parallel Sessions 3 กลุ่มที่ 1
วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.45 น. ห้อง CE05303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: รองศาสตราจารย์ ดร.สมบูรณ์ อนันตลาโภชัย มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.อนุเทพ ภาสุระ มหาวิทยาลัยบูรพา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.อรอำไพ จำภา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	BIO-O79	Antimicrobial effect of locally produced silver diamine fluoride	ศุภนิดา แก้วกำชัย
2	09.45-10.00 น.	BIO-O80	Enhancing bio-electricity generation from the palm oil mill effluent in microbial fuel cell coupled with bilirubin oxidase producing bacteria	จันทร์จิรา ทิพย์รักษา
3	10.00-10.15 น.	BIO-O81	Screening of phylloplane bacteria for controlling <i>Xanthomonas oryzae</i> pv. <i>oryzae</i>	อภิขญา แสงแก้ว
4	10.15-10.30 น.	BIO-O82	The growth rate of thermotolerant yeast under multi-stress factors	ณภัทร ภัคดีวงษ์
5	10.30-10.45 น.	BIO-O83	Effects of nitrogen and carbon sources on the inulinase production from strain <i>Penicillium citrinum</i> IS13	มนัสนันท์ กัญฐ์ศสกุล

Parallel Sessions 4 กลุ่มที่ 1

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.30 น. ห้อง CE05304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.นลินา ประไพรักษ์สิทธิ์ มหาวิทยาลัยศรีนครินทรวิโรฒ

Committee 1: ดร.นิจติยา สุวรรณสม มหาวิทยาลัยพะเยา

Committee 2: ดร.ภูมิน นุตระทัต มหาวิทยาลัยทักษิณ

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	BIO-O84	Antibacterial and anticancer activities of 3,4-dihydrolactucin isolated from <i>Microbispora</i> sp. AL22	ธงชัย เตโชวิศาล
2	09.45-10.00 น.	BIO-O85	Development of anti-aging serum from corn extract	ภักจิรา ทองสุทธิ
3	10.00-10.15 น.	BIO-O86	Physiologically based pharmacokinetic / pharmacodynamic modeling of ketamine in humans	ณิชากาญจน์ เดียวสุรินทร์
4	10.15-10.30 น.	BIO-O87	Application of advanced mass spectrometry-based proteomics to identify and quantify plasma proteins of patients with colorectal cancer	วรรัตน์ แซ่มพัฒนาชัย

Parallel Sessions 5 กลุ่มที่ 1

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.45 น. ห้อง CE05402

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.สิทธิศักดิ์ ปิ่นมวงคลกุล มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.อนุกุล บุรณประทีปรัตน์ มหาวิทยาลัยบูรพา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.อาทิตย์ นันทขว้าง มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	BIO-O88	Carbon accumulation in above ground biomass of tree in natural forest at Ban Romklao Botanical Garden Phitsanulok under the Royal Initiative	ณัฐดนัย ปานอินทร์
2	09.45-10.00 น.	BIO-O89	The study of the carbon footprint of an school case study of Phra Pariyattidhamma school, Nan Province	พัชรีย์ ชัดศิริ
3	10.00-10.15 น.	BIO-O90	Assessing the carbon footprint and creating guidelines to reduce greenhouse gas emissions of halal food products. Case study: Salted Gu Lao Fish Products Kulao Thong Mae Pan Tak Bai	ชลลดา กำใจ
4	10.15-10.30 น.	BIO-O91	The value-added products and the assessment of carbon footprint and cost of production from ginger residue	ฐานะมาศ ศรีไชยเจริญวงศ์
5	10.30-10.45 น.	BIO-O92	A study on ways to reduce greenhouse gas emissions from the production of halal food products in Pattani Province with the low emission support scheme (LESS).	ภัทราวดี วังแสง

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 2 สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม

เวลา 13.30-14.00 น.

Chairperson: รองศาสตราจารย์ ดร.รัชนาพร โชคชัยศิริ มหาวิทยาลัยพะเยา

Invited speaker: รองศาสตราจารย์ ดร.ศรัชย์ อินทะไชย คณะวิทยาศาสตร์ มหาวิทยาลัยทักษิณ

บรรยายในหัวข้อ: การพัฒนาวัสดุคอมโพสิตที่มีความจำเพาะต่อการกำจัดสารเคมีอันตรายในน้ำเสีย อย่างมีประสิทธิภาพและ

ง่ายดาย (Development of specific-functioned composite materials for efficient and facile removal of hazardous chemicals in wastewater)

ห้อง: CE05203 อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบลาคัญุมมาจารย์ (ปวง ธมเมปถัญญ)

เวลา 14.15-17.00 น. แยกนำเสนอผลงานแบบบรรยายตามห้อง

Session (Room)	Time										
	14.15-14.30	14.30-14.45	14.45-15.00	15.00-15.15	15.15-15.30	15.30-15.45	15.45-16.00	16.00-16.15	16.15-16.30	16.30-16.45	16.45-17.00
Session 1 (CE05203)	CHEM-O1	CHEM-O2	CHEM-O3	CHEM-O4		พัก 15 นาที นำเสนอเอกสารอัปโหลดไฟล์	CHEM-O5	CHEM-O6	CHEM-O7		
Session 2 (CE05204)	CHEM-O8	CHEM-O9	CHEM-O10	CHEM-O11			CHEM-O12	CHEM-O13	CHEM-O14		



Parallel Sessions 1 กลุ่มที่ 2

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE05203

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: รองศาสตราจารย์ ดร.รัชนาพร โชคชัยศิริ มหาวิทยาลัยพะเยา

Committee 1: ดร.คงเดช สวาสดีพันธ์ มหาวิทยาลัยพะเยา

Committee 2: ดร.บุญทริกา เทพสุคนธ์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	CHEM-O1	High stability nanocellulose pickering emulsion in control the release of eucalyptus oils	พิทยา ทรงโฉม
2	14.30-14.45 น.	CHEM-O2	Chemical constituents and biological activities of essential oil from <i>Mansoa alliacea</i> L. flowers	ชิษณุพงศ์ สมศรีวัฒนา
3	14.45-15.00 น.	CHEM-O3	Developing composite adsorbent of activated carbon and CuAl-based material for removing Krajoood dyes in water	อเนก ขุนพล
4	15.00-15.15 น.	CHEM-O4	Sago palm fiber nanocellulose as a sustainable adsorbent for malachite green dye removal and its application in environmental remediation	สวรัชชย์ รักษา
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 1 กลุ่มที่ 2

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.30 น. ห้อง CE05203

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ดร.ชัยพัฒน์ ลาพินี มหาวิทยาลัยพะเยา

Committee 1: อาจารย์มนัส ใจมะสิทธิ์ มหาวิทยาลัยพะเยา

Committee 2: ดร.วรรณฤดี แก้วมีศรี มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	CHEM-O5	Conformational itinerary of melibiose during transglycosylation by α -galactosidase	เบญญาภา คฤหัส
2	16.00-16.15 น.	CHEM-O6	Mapping the conformational itinerary of galactomannan hydrolysis in α -galactosidase by Cremer-Pople analysis	ธมนวรรณ พัฒนประดิษฐ์
3	16.15-16.30 น.	CHEM-O7	Comparison in beta-glucan extraction from mixed defatted rice bran cultivars and Khao Dawk Mali defatted rice bran cultivar using Taguchi method of experimental design	พัตราพร ภูวดลไพศาล

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์ สาขาวิชาสถิติ

- เวลา 13.30-14.00 น. **Chairperson:** ผู้ช่วยศาสตราจารย์ ดร.ฉัตร เกตุคำ มหาวิทยาลัยพะเยา
Invited speaker: รองศาสตราจารย์ ดร.อัยเรศ เอี่ยมพันธ์ คณะวิทยาศาสตร์ มหาวิทยาลัยพะเยา
บรรยายในหัวข้อ: Lattice valued fuzzy sets in UP (BCC)-algebras
ห้อง: CE06204 **อาคาร:** อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมมปัญญา)
- เวลา 14.15-17.00 น. **ยกนำเสนอผลงานแบบบรรยายตามห้อง**

Session (Room)	Time										
	14.15- 14.30	14.30- 14.45	14.45- 15.00	15.00- 15.15	15.15- 15.30	15.30-15.45	15.45- 16.00	16.00- 16.15	16.15- 16.30	16.30- 16.45	16.45- 17.00
Session 1 (CE06204)	MATH-O1	MATH-O2	MATH-O3	MATH-O4	MATH-O5	พัก 15 นาที Upload file	MATH-O10	MATH-O11	MATH-O12	MATH-O13	
	MATH-O6	MATH-O7	MATH-O8	MATH-O9			MATH-O14	MATH-O15	MATH-O16	MATH-O17	
Session 2 (CE06205)											

Parallel Sessions 1 กลุ่มที่ 3

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE06204

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.อัยเรศ เอี่ยมพันธ์ มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.มะลิวัลย์ ภัทรชาติกุล มหาวิทยาลัยมหาสารคาม

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.ธิตี เกตุคำ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	MATH-O1	On a problem of partitions of Z_m with the same representation functions	ณัฐนันท์ ตีอินทร์
2	14.30-14.45 น.	MATH-O2	The numbers of numerical semigroups $\{0\} \cup [a,b] \cup [c,d] \cup [e, \infty)$ which having same Frobenius number	ณัฐวรรณ ปิ่นอินทร์
3	14.45-15.00 น.	MATH-O3	Reverse order laws for the (b,c) -inverse in γ -ring	ธนาภา โพธิพล
4	15.00-15.15 น.	MATH-O4	Absorption laws for the (b,c) -inverse in γ -ring	พรทิพย์ กันณาสิทธิ์
5	15.15-15.30 น.	MATH-O5	On isomorphisms between generalized quaternion rings and matrix rings over certain finite fields	สิริพงศ์ ศิริสุข
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 2 กลุ่มที่ 3

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.- 15.15 น. ห้อง CE06205

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.เอกชัย หลายศิริกุล มหาวิทยาลัยนเรศวร

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.สุภลักษณ์ ศรีนิล มหาวิทยาลัยนเรศวร

Committee 2: อาจารย์ศรัณยา พองจันทร์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	MATH-O6	(1+u)-Constacyclic codes and cyclic codes over $F_2[u]/(u^4)$	ศุภชัย สอนไฉ
2	14.30-14.45 น.	MATH-O7	On absorb BE-algebras	อรรถพล ภูมิลา
3	14.45-15.00 น.	MATH-O8	Upper bounds for the total domination numbers of Cartesian products of directed cycles	ญาณิศา ชัยยา
4	15.00-15.15 น.	MATH-O9	The k-domination number and connected k-domination number in some graphs.	ปรารงค์ทอง สิงห์แก้ว
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 1 กลุ่มที่ 3

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.45 น. ห้อง CE06204

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.พัชรี มณีรัตน์ มหาวิทยาลัยราชภัฏอุตรดิตถ์

Committee 1: ดร.ศัสยมน สุขแสงรักษ์เจริญ มหาวิทยาลัยพะเยา

Committee 2: ดร.ปิยดา พฤกส์สวัสดิ์นนท์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	MATH-O10	Statistical estimation for the median of the Delta-Lognormal distribution	อุษณีย์ จันทะสุวรรณ
2	16.00-16.15 น.	MATH-O11	Confidence intervals for the mean of Birnbaum-Saunders distributions	ณัฐชยา รตะสุขารมย์
3	16.15-16.30 น.	MATH-O12	Non-parametric bootstrap confidence intervals for the population mean of the Zero-Truncated Poisson-Aradhana distribution	วราฤทธิ์ พานิชกิจโกศลกุล
4	16.30-16.45 น.	MATH-O13	The SARIMA-ANN models study for forecasting the number of dengue patients in Phitsanulok Province	ทิพย์ภาพร วังคีรี

Parallel Sessions 2 กลุ่มที่ 3

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.45 น. ห้อง CE06205

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.อภิศักดิ์ ไชยโรจน์วัฒนา มหาวิทยาลัยบูรพา
 Committee 1: ดร.สุลาวัลย์ ยศธนู มหาวิทยาลัยพะเยา
 Committee 2: ดร.เขมวดี ปรีดาลิขิต มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	MATH-O14	Flood forecasting model at M.5 Rasri Salai station	พงศกร มลสิน
2	16.00-16.15 น.	MATH-O15	The expected lottery prize and the accuracy of two digits lottery number	กชพร ดีอินทร์
3	16.15-16.30 น.	MATH-O16	Estimating the expected return from investing in stocks	บุญพัฒน์ เชียงฉิน
4	16.30-16.45 น.	MATH-O17	The performance comparison of classification by state of business about construction and real estate in Thailand	มัลลิกา ชนะภัย

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 26 พฤษภาคม 2566

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์ สาขาวิชาสถิติ

เวลา 9.30-12.00 น. แยกนำเสนอผลงานแบบบรรยายตามห้อง

Session (Room)	Time										
	9.30-9.45	9.45-10.00	10.00-10.15	10.15-10.30	10.30-10.45	10.45-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.00	
Session 1 (CE06204)	MATH-O18	MATH-O19	MATH-O20	MATH-O21							
Session 2 (CE06205)	MATH-O22	MATH-O23	MATH-O24	MATH-O25							



การประชุมวิชาการระดับชาติ"วิทยาศาสตร์วิจัย" ครั้งที่ 14

Parallel Sessions 1 กลุ่มที่ 3

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.30 น. ห้อง CE06204

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: รองศาสตราจารย์ ดร.วัชรภรณ์ ซ่อล้าเจียก มหาวิทยาลัยพะเยา

Committee 1: รองศาสตราจารย์ ดร.ประสิทธิ์ ซ่อล้าเจียก มหาวิทยาลัยพะเยา

Committee 2: ดร.วัชรพงษ์ อนรรทมเมธี มหาวิทยาลัยนเรศวร

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	MATH-O18	Optimization of batik production using the quick simplex method	จิรวรรณ พัชรประภิติ
2	09.45-10.00 น.	MATH-O19	Comparison of algorithm performance for a forecasting insurance premium payment suspension during the contract of the insured by using the machine learning technique	จิราภรณ์ อภิรักษ์มงคล
3	10.00-10.15 น.	MATH-O20	A Classification of black mold image of longan leaves with deep learning techniques based on convolution neural network	วัลยา แก้วจา
4	10.15-10.30 น.	MATH-O21	Modified Jungck S-iteration to generate polynomiographs applicable in nonlinear complex functions	ชนม์เจริญ ชัยรัตน์สิริพงศ์



การประชุมวิชาการระดับชาติ"วิทยาศาสตร์วิจัย" ครั้งที่ 14

Parallel Sessions 2 กลุ่มที่ 3

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.30 น. ห้อง CE06205

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ดร.สีบบกุล กาญจนสุกร มหาวิทยาลัยพะเยา

Committee 1: อาจารย์ศิริวรรณ อินทวิชัย มหาวิทยาลัยพะเยา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.ธิตี เกตุคำ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	MATH-O22	A Mathematical model of hand, foot, and mouth disease with the investigation of the lockdown effect	ชนิตา รักสกุล
2	09.45-10.00 น.	MATH-O23	A Mathematical model of COVID-19 with control strategies and Its dynamics	พุทธรักษ์ โสตานา
3	10.00-10.15 น.	MATH-O24	Study of the 5 th wave of COVID-19 outbreak in Thailand using Mathematical model	ปิ่นณธร เครือคนโท
4	10.15-10.30 น.	MATH-O25	Mathematical models to predict the inhibitory effect of <i>Staphylococcus aureus</i> by clove extract	สิปปกร กุลตัน

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา และคณิตศาสตร์ศึกษา

Parallel Sessions 1 กลุ่มที่ 4

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE06304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปถุญญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.รุ่งทิวา กองสอน มหาวิทยาลัยพะเยา

Committee 1: ดร.วรรณกร พรประเสริฐ มหาวิทยาลัยพะเยา

Committee 2: ดร.เกศราพรรณ พันธุ์ศรีเกตุ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	EDU-O1	The organization of learning activities on the factorization of one variable two-degree polynomial using games base learning to promote algebraic thinking of grades 8 students	ธนจิรวัดน์ ศรีสุธัญญาวงศ์
2	14.30-14.45 น.	EDU-O2	Effects of education programs in science museum using inquiry and storyline approach on science learning motivation	ภัทรภาพร ทองเกษร
3	14.45-15.00 น.	EDU-O3	Learning Management by using Model-Based Inquiry and Scientific Experiments for Developing Mental Model for 7 th grade students in Cell Transport	ธนารัตน์ ทรัพย์สม
4	15.00-15.15 น.	EDU-O4	Model-based learning activities combined with game-based teaching methods promote critical thinking skills in the earth and natural resources learning unit for junior high school students	อัมพร อายี่กู
5	15.15-15.30 น.	EDU-O5	Mathematics learning management innovation using infographics and word walls for schools with teacher shortages	ทวีสิทธิ์ ปัญญา
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 1 กลุ่มที่ 4

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.- 16.45 น. ห้อง CE06304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.รุ่งทิวา กองสอน มหาวิทยาลัยพะเยา

Committee 1: ดร.วรรณกร พรประเสริฐ มหาวิทยาลัยพะเยา

Committee 2: ดร.เกศราพรรณ พันธุ์ศรีเกตุ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	EDU-O6	Development of 8 th grade students' scientific argumentation skills through argument-driven inquiry with higher order questions in energy resources topic	ฉัญญรัตน์ สุวรรณไตรย์
2	16.00-16.15 น.	EDU-O7	A study on the effect of learning management of introduction to data science course with JARU model for Matthayom 4 students of Satthasamut school	จารุวัตร นาควิมล
3	16.15-16.30 น.	EDU-O8	Investigating Thai eighth grade students' scientific problem - solving ability on global and national resource topics	จิรายุส เรือนนงการ
4	16.30-16.45 น.	EDU-O9	Studying a model of human eyes by adjustable liquid lens	ณัฐกร สุทธิวรรณ

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 26 พฤษภาคม 2566

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา และคณิตศาสตร์ศึกษา

Parallel Sessions 1 กลุ่มที่ 4

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-10.45 น. ห้อง CE06304

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุปาสีคุณูปมาจารย์ (ปวง ธम्मปญโญ)

Chairperson: รองศาสตราจารย์ ดร.รักษิต สุทธิพงษ์ มหาวิทยาลัยพะเยา

Committee 1: ดร.วรรณกร พรประเสริฐ มหาวิทยาลัยพะเยา

Committee 2: ดร.เกศราพรรณ พันธุ์ศรีเกตุ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	EDU-O10	The use of PhET interactive simulation in fundamental Physics laboratory: electromotive force and internal resistance	ชาญวิทย์ คำเจริญ
2	09.45-10.00 น.	EDU-O11	Simple apparatus for measuring speed of sound in air at various temperatures by frequency domain resonance tube	อดิศร บูรณวงศ์
3	10.00-10.15 น.	EDU-O12	Current trends toward enhancing scientific literacy	ณัฐดนัย นิรุตต์เมธีกุล
4	10.15-10.30 น.	EDU-O13	Relationship between behavior and food consumption knowledge according to nutrition principles of exercise science and sports students University of Phayao	ปราณี อยู่ศิริ
5	10.30-10.45น.	EDU-O14	Offensive patterns analysis of Thai nation team in Volleyball women's nations league 2022	สุรียนต์ เหลืองทรงกิจ

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25-26 พฤษภาคม 2566

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์ เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

เวลา 13.30-14.00 น. Chairperson: อาจารย์อาจารย์ นาโต มหาวิทยาลัยทักษิณ

Invited speaker: ผู้ช่วยศาสตราจารย์ ดร.เกรียงศักดิ์ เตมีย คณะวิทยาศาสตร์ มหาวิทยาลัยนเรศวร

บรรยายในหัวข้อ: Big data, Data science and Machine learning

ห้อง: CE06303 อาคาร: อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

วันที่ 25 พฤษภาคม 2566 /Time											
Session (Room)	14.15-14.30	14.30-14.45	14.45-15.00	15.00-15.15	15.15-15.30	15.30-15.45	15.45-16.00	16.00-16.15	16.15-16.30	16.30-16.45	16.45-17.00
Session 1 (CE06303)	COM-01	COM-02	COM-03	COM-04	COM-05	พัก 15 นาที ผู้นำเสนอรอบถัดไป Upload file	COM-06	COM-07	COM-08	COM-09	

วันที่ 26 พฤษภาคม 2566/Time										
Session (Room)	9.30-9.45	9.45-10.00	10.00-10.15	10.15-10.30	10.30-10.45	10.45-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.00
Session 1 (CE06204)	COM-010	COM-011	COM-012	COM-013	COM-014	COM-015				

Parallel Sessions 1 กลุ่มที่ 5

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE06303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.กฤติกา กันทวงศ์ มหาวิทยาลัยพะเยา

Committee 1: ดร.โรจน์ ชุมมงคล มหาวิทยาลัยพะเยา

Committee 2: อาจารย์อาจารย์ นาโค มหาวิทยาลัยทักษิณ

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	COM-O1	Development of dashboard for the satisfaction assessment	อภิชัย ชื้อสัตย์สกุลชัย
2	14.30-14.45 น.	COM-O2	A development of DVe-Sar system to report self assessment results for department level at Chiang Rai vocational college	ปิยมาส แก้วอินตา
3	14.45-15.00 น.	COM-O3	A team-member recommendation system to assigned tasks using analytic hierarchy process	NGUYEN HOANG ANH
4	15.00-15.15 น.	COM-O4	Information system for COVID-19 infected students in Naresuan University Secondary Demonstration School	ชนกันต์ วงษ์นิ่ม
5	15.15-15.30 น.	COM-O5	Information system development for management of small distilled liquor factories of Phayao area excise office	ศิวปรียา ประเสริฐรังษ์

พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file

Parallel Sessions 1 กลุ่มที่ 5

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.45 น. ห้อง CE06303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.จันตรี ผลประเสริฐ มหาวิทยาลัยศรีนครินทรวิโรฒ

Committee 1: ดร.นราศักดิ์ บุญเทพ มหาวิทยาลัยพะเยา

Committee 2: ดร.เสถียร หันตา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	COM-O6	Hybrid-dimension association rule and customer clustering: case study in construction business	ชัยโรจน์ หล่อไพบุลย์
2	16.00-16.15 น.	COM-O7	Multi-scenario satellite drought assessment using moisture stress index (MSI) in Mae Suk watershed, Mae Chai district, Phayao Province	ศิริวรรณ รื่นรัมย์
3	16.15-16.30 น.	COM-O8	A comparison of the accuracy of aerial imagery maps obtained from small unmanned aerial vehicles at various altitudes.	ภาณุ อุทัยศรี
4	16.30-16.45 น.	COM-O9	Design of a controlled wheelchair with smart wearable device using gyroscope sensor for assisting people with disabilities	ณภัทร มณีฉาย

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 26 พฤษภาคม 2566

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์ เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

Parallel Sessions 1 กลุ่มที่ 5

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-11.00 น. ห้อง CE06303

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปญโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.ปรัชญา นวนแก้ว มหาวิทยาลัยพะเยา

Committee 1: ดร.วงษ์ปัญญา นวนแก้ว มหาวิทยาลัยพะเยา

Committee 2: รองศาสตราจารย์ ดร.ดำรงศักดิ์ แยมบางหวาย มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	COM-O10	Medical appointment scheduling software using Q care application for clinics	ปิ่นนัทธ กันตังกุล
2	09.45-10.00 น.	COM-O11	Development of mobile application for tracking medications of elderly patients	พงศ์สฤษฎ์ เกตุแก้ว
3	10.00-10.15 น.	COM-O12	Automatic flower detection for some orchid identification using convolution neural networks	สิริวิมล โมอินทร์
4	10.15-10.30 น.	COM-O13	Comparison of classification models performance with financial data	ปราวฟ้า โภษศิริศิลป์
5	10.30-10.45 น.	COM-O14	Face emotion classification of human using convolutional neural network technique of deep learning	ชรีวัฒน์ กลมกล่อม
6	10.45-11.00 น.	COM-O15	Automatic attendance system with facial recognition	จิรภัทร สุภาพินิจ

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

เวลา 13.30-14.00 น. Chairperson: ดร.นิยม โธ่งสิทธิ์ มหาวิทยาลัยพะเยา

Invited speaker: รองศาสตราจารย์ ดร.ธนา ยีรัมย์ คณะวิทยาศาสตร์ มหาวิทยาลัยมหาสารคาม

บรรยายในหัวข้อ: Space weather impacts in relation to high speed solar wind streams

ห้อง: CE06403 อาคาร: อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปัญญา)

เวลา 14.15-17.00 น. แยกนำเสนอผลงานแบบบรรยายตามห้อง

		Time											
Session (Room)		14.15-14.30	14.30-14.45	14.45-15.00	15.00-15.15	15.15-15.30	15.30-15.45	15.45-16.00	16.00-16.15	16.15-16.30	16.30-16.45	16.45-17.00	
Session 1 (CE06403)	PHY-O1	PHY-O2	PHY-O3	PHY-O4	พัก 15 นาที นำเสนอออนไลน์ Upload file			PHY-O5	PHY-O6	PHY-O7	PHY-O8		
Session 2 (CE06404)	PHY-O9	PHY-O10	PHY-O11				PHY-O12	PHY-O13	PHY-O14				
Session 3 (CE06405)	PHY-O15	PHY-O16	PHY-O17	PHY-O18			PHY-O19	PHY-O20	PHY-O21	PHY-O22			

Parallel Sessions 1 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE06403

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ศาสตราจารย์ ดร.ธีระชัย บงการณฺ์ มหาวิทยาลัยนเรศวร

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ทงศักดิ์ โนไชยา มหาวิทยาลัยนเรศวร

Committee 2: ดร.สมฤทธิ อุ่นอ้าย มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	PHY-O1	Effect of source-to-substrate distance on radial distribution of ta-C films in filtered cathodic Arc discharge	ณัฐพัส ชนะภัย
2	14.30-14.45 น.	PHY-O2	Temperature dependence of AC electrical properties in graphitic carbon nitride compact	ทศพล เมลืองนนท์
3	14.45-15.00 น.	PHY-O3	The effect of different functional monomer of zirconia primer and universal adhesive on shear bond strength of zirconia to composite resin using resin cement	พิมพ์ชนก พิทักษ์อัสวกุล
4	15.00-15.15 น.	PHY-O4	Effect of potassium oleate on X-ray attenuation properties of natural rubber/barium sulfate composite	นิศามล ทองแหม
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 1 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.45 ห้อง CE06403

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโณ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.อดิศร บุรณวงศ์ มหาวิทยาลัยบูรพา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ศศิพร ประเสริฐपालิฉัตร มหาวิทยาลัยนครสวรรค์

Committee 2: ดร.นิยม โส่งสิทธิ์ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	PHY-O5	Study of kinuta glaez is recycling silica from glass beer bottle	ณัฐรัฐภูมิ อริยะะจิณโณ
2	16.00-16.15 น.	PHY-O6	Influence of formic acid concentration on properties of rubber ribbed smoked sheet	สายสุณี จิตกล้า
3	16.15-16.30 น.	PHY-O7	Integrating phase change materials to the SHERA wood wall for improving the efficiency of heat transmission reduction	เดชาพล เขียวแก้ว
4	16.30-16.45 น.	PHY-O8	Study of production of 5-hydroxymethylfurfural from corn cobs by dehydration reaction using formic acid and sodium hydroxide as reagents	ณัฐพล คงวัฒนะ

Parallel Sessions 2 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE06404

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.กัญจน์ชญา หงส์เลิศคงสกุล มหาวิทยาลัยบูรพา

Committee 1: ดร.ชลธิชา กฤษณ์เพ็ชร มหาวิทยาลัยพะเยา

Committee 2: ดร.สิริกมล แสงมีอานูภาพ มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	PHY-O9	Investigation of fire resistance and physical properties of refractory brick using oil palm bunch	รภัทพล ถกลประจักษ์
2	14.30-14.45 น.	PHY-O10	Preparation of cellulose separator for lithium-Ion battery from red water lily and water hyacinth fibers.	ศศิวิมล แก้วทองสอน
3	14.45-15.00 น.	PHY-O11	Study of physical properties and gamma-ray shielding properties of natural rubber /calcium carbonate composite	สุทธิษา ก้อนเรือง
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรอบถัดไป Upload file				

Parallel Sessions 2 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.–16.30 น. ห้อง CE06404

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.พจนศักดิ์ ศักดิ์พจนนา มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.อาร์ักษ์ กลิ่นบำรุง มหาวิทยาลัยพะเยา

Committee 2: ดร.พิมพ์ใจ แสงความสว่าง มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	PHY-O12	Study of biodegradable poly (lactic acid)/ thermoplastic starch/bio-silica composites	ปิยนันท์ บุญพยัคฆ์
2	16.00-16.15 น.	PHY-O13	Influence of aluminium contents on the structure and hardness of chromium aluminium nitride thin films	นิรันดร์ วิทิตอนันต์
3	16.15-16.30 น.	PHY-O14	Efficient detection of SO ₂ gas using rGO/SnO ₂ nanocomposites-based sensors	วิรัชชา เครือฟู



การประชุมวิชาการระดับชาติ"วิทยาศาสตร์วิจัย" ครั้งที่ 14

Parallel Sessions 3 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.15 น. ห้อง CE06405

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ดร.วัชรารุณี กฤตินธรรม มหาวิทยาลัยพะเยา

Committee 1: ดร.วิทยา ทิพย์อักษร มหาวิทยาลัยทักษิณ

Committee 2: ดร.ศุภกร จันเลน มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	PHY-O15	The off-cardinal alignment of Chiang Mai's city plan in relation to the Orion's belt	ชยพล เอี่ยมสนธิ
2	14.30-14.45 น.	PHY-O16	Optically stimulated luminescence dating revealed the late quaternary coastal sediments in Songkhla coast, Thailand	อาร์ฟ แลรอชา
3	14.45-15.00 น.	PHY-O17	The effects of initial numbers of dice on decay constant	พงษ์ศักดิ์ โขขุนทด
4	15.00-15.15 น.	PHY-O18	Applying optical technique to determine value of Young's modulus	ภราดร ภัคดีวานิช
พักรับประทานอาหารว่าง 15 นาที ผู้นำเสนอรีบกลับไป Upload file				

Parallel Sessions 3 กลุ่มที่ 6

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.–16.45 น. ห้อง CE06405

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปณฺโญ)

Chairperson: รองศาสตราจารย์ ดร.ธนา ยี่รัมย์ มหาวิทยาลัยมหาสารคาม

Committee 1: ดร.สุทธิษา ก้อนเรือง มหาวิทยาลัยทักษิณ

Committee 2: ดร.พงศพัศ แรงดี มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.15-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	PHY-O19	Theoretical study of electrical properties of twisted bilayer graphene	พิชาญ พรหมจักร
2	16.00-16.15 น.	PHY-O20	Moiré fringes analysis of parallel gratings by eliminating the effect of high frequency components	อนุชา แก้วพูลสุข
3	16.15-16.30 น.	PHY-O21	Anisotropic flow in Au + Au collision at 1 A GeV by using quantum molecular dynamics model	กันติชา กันแก้ว
4	16.30-16.45 น.	PHY-O22	Collective expansion of K^+ mesons in heavy-ion collisions on the effect of in-medium Kaon potential and the nuclear equation of state	วรรณภา คำจิ้น

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 26 พฤษภาคม 2566

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

เวลา 9.30-12.00 น. แยกนำเสนอผลงานแบบบรรยายตามห้อง

Session (Room)	Time										
	9.30-9.45	9.45-10.00	10.00-10.15	10.15-10.30	10.30-10.45	10.45-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.00	
Session 1 (CE06403)	PHY-O23	PHY-O24	PHY-O25	PHY-O26	PHY-O27	PHY-O28					
Session 2 (CE06404)	PHY-O29	PHY-O30	PHY-O31	PHY-O32	PHY-O33	PHY-O34	PHY-O35				

Parallel Sessions 1 กลุ่มที่ 6

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-11.00 น. ห้อง CE06403

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.วุฒิศาสตร์ โชคเกื้อ มหาวิทยาลัยมหาสารคาม

Committee 1: รองศาสตราจารย์ ดร.ไวพจน์ งามสอาด มหาวิทยาลัยพะเยา

Committee 2: ดร.ฉัตรแก้ว ชัยลือชา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	PHY-O23	Mobile photovoltaic power system	พิชากัด ทองสุทธิ
2	09.45-10.00 น.	PHY-O24	Trash separator	ปรียากร ราชพรหมินทร์
3	10.00-10.15 น.	PHY-O25	The biofilm-based triboelectric generator from durian peel	ภัทรชา คงชนะ
4	10.15-10.30 น.	PHY-O26	Triboelectric generator from the natural rubber	ปรางวิไล พุทธิมี
5	10.30-10.45 น.	PHY-O27	Electric energy harvesting from mechanical force by Cassava bioplastic films	ณัฐพล คงถาวร
6	10.45-11.00 น.	PHY-O28	Process optimization of reclaimed rubber preparation from tire waste	ภัศรา สุวรรณสิงห์

Parallel Sessions 2 กลุ่มที่ 6

วันศุกร์ที่ 26 พฤษภาคม 2566

เวลา 09.30 น.-11.15 น. ห้อง CE06404

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธรรมปณฺโญ)

- Chairperson:** รองศาสตราจารย์ ดร.อนุชา แก้วพูลสุข มหาวิทยาลัยนเรศวร
- Committee 1:** ผู้ช่วยศาสตราจารย์ ดร.สุรจุมิ วิจารณ์ มหาวิทยาลัยศรีนครินทรวิโรฒ
- Committee 2:** อาจารย์ไพศาล ดวงจักร์ ณ อยู่ชยา มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 09.00-09.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	09.30-09.45 น.	PHY-O29	Heart rate and blood oxygen saturation monitor based on IoT.	กัญจน์รัชต์ เปี่ยมสุขงษ์ทอง
2	09.45-10.00 น.	PHY-O30	Development of pH and humidity measurement and control systems in hydroponic plants greenhouses with IoT technology by Blynk application on a smartphone	ปิติโชติ จิตรแก้ว
3	10.00-10.15 น.	PHY-O31	Development of a sensor system for measuring sound frequency in beehives to analyze the behavior of bees after being impacted by external noise disturbance	ชยพัทธ์ เวียงนาคแสนสุข
4	10.15-10.30 น.	PHY-O32	Development of an application to measure arterial oxygen saturation and monitor falls in the elderly using ML and IoT	ณัฐพงศ์ อภิรัชตานนท์
5	10.30-10.45 น.	PHY-O33	Measurement and control system for water and nutrient supply for melon houses using IoT	สุदारัตน์ โตกำแพง
6	10.45-11.00 น.	PHY-O34	Recognition of squat strength exercises based on machine learning system	พัฒนศักดิ์ สหวิศิษฐ์
7	11.00-11.15 น.	PHY-O35	Wearable ECG and heart rate recorder for smart healthcare systems	ธาดา อ้นคง

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 7 สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์

Parallel Sessions 1 กลุ่มที่ 7

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 14.15 น.-15.30 น. ห้อง CE06305

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธมมปณฺโญ)

- Chairperson: ผู้ช่วยศาสตราจารย์ ดร.รัฐภูมิ พรหมณะ มหาวิทยาลัยพะเยา
- Committee 1: ผู้ช่วยศาสตราจารย์ ดร.ภูนิศรา ลีมนนทกุล มหาวิทยาลัยศรีนครินทรวิโรฒ
- Committee 2: ผู้ช่วยศาสตราจารย์ ดร.นพมาศ ปักเข็ม มหาวิทยาลัยทักษิณ

***Upload file การนำเสนอผลงาน 13.00-13.30 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	14.15-14.30 น.	INNO-O1	An Automated guided vehicle robot for transport in confined place	นพกร กันทาภาค
2	14.30-14.45 น.	INNO-O2	Lifting posture monitoring application for preventing ergonomics risk factors	วริศรา จงสมบุรณ์โกศา
3	14.45-15.00 น.	INNO-O3	Smart lock system by IoT	ณัฐพงษ์ ทิพพาหา
4	15.00-15.15 น.	INNO-O4	Plastic recycling machine	วีร์ วรศิลป์ชัย
5	15.15-15.30 น.	INNO-O5	Development of tamarind sauce and spicy sauce for ready-to-eat fried chicken with consumption convenience.	ชินกมล ปัญญาวยง

ตารางการนำเสนอผลงานแบบบรรยาย วันที่ 25 พฤษภาคม 2566

กลุ่มที่ 8 Routine to Research

Parallel Sessions 1 กลุ่มที่ 8

วันพฤหัสบดีที่ 25 พฤษภาคม 2566

เวลา 15.45 น.-16.30 น. ห้อง CE06305

อาคารเรียนรวม (หลังใหม่) และอาคาร 99 ปี พระอุบาลีคุณูปมาจารย์ (ปวง ธम्मปญฺโญ)

Chairperson: ผู้ช่วยศาสตราจารย์ ดร.สันธิวัฒน์ พิทักษ์พล มหาวิทยาลัยพะเยา

Committee 1: ผู้ช่วยศาสตราจารย์ ดร.คมกฤษ ตาชม มหาวิทยาลัยพะเยา

Committee 2: ผู้ช่วยศาสตราจารย์ ดร.ธิวานนท์ พูพวก มหาวิทยาลัยพะเยา

***Upload file การนำเสนอผลงาน 15.30-15.45 น.

ลำดับที่	เวลา	รหัส	หัวข้อเรื่อง	ผู้นำเสนอ
1	15.45-16.00 น.	R2R-O1	Development of information system for management research project fund of science faculty, Naresuan University	สุชีลา พุ่มอยู่
2	16.00-16.15 น.	R2R-O2	The development and database system for risk management and internal control faculty of science University of Phayao	ลิตา เทียนหวาน
3	16.15-16.30 น.	R2R-O3	A study of motivation to study at the Faculty of Science, Mahasarakham University	อนันษา ทองเหลา

กำหนดการนำเสนอผลภาคโปสเตอร์ (Session Poster Presentation)

งานประชุมวิชาการระดับชาติ วิทยาศาสตร์วิจัย ครั้งที่ 14 (14th Science Research Conference, SRC14)
วันที่ 25-26 พฤษภาคม 2566 ณ มหาวิทยาลัยพะเยา

ตารางเวลานำเสนอโปสเตอร์เพื่อให้ข้อมูลต่อคณะกรรมการตัดสินและผู้เยี่ยมชมผลงาน วันที่ 25 พฤษภาคม 2566

BIO	BIO-P1	BIO-P2	BIO-P3	BIO-P4	BIO-P5	BIO-P6	BIO-P7	BIO-P8	BIO-P9	BIO-P10
	BIO-P11	BIO-P12	BIO-P13	BIO-P14	BIO-P15	BIO-P16	BIO-P17	BIO-P18	BIO-P19	BIO-P20
	BIO-P22	BIO-P23	BIO-P24	BIO-P25	BIO-P26	BIO-P27	BIO-P28	BIO-P29	BIO-P30	BIO-P31
	BIO-P32	BIO-P33	BIO-P34	BIO-P35	BIO-P36	BIO-P37	BIO-P38	BIO-P39	BIO-P340	BIO-P41
BIO	BIO-P42	BIO-P43	BIO-P44	BIO-P45	BIO-P46	BIO-P47	BIO-P48	BIO-P49	BIO-P50	
	BIO-P51	BIO-P52	BIO-P53	BIO-P54	BIO-P55	BIO-P56	BIO-P57	BIO-P58	BIO-P59	BIO-P60
	BIO-P61	BIO-P62	BIO-P63	BIO-P64	BIO-P65	BIO-P66	BIO-P67	BIO-P68	BIO-P69	BIO-P70
	BIO-P71	BIO-P72	BIO-P73	BIO-P74	BIO-P75	BIO-P76	BIO-P77	BIO-P78	BIO-P79	BIO-P80
CHEM	CHEM-P1	CHEM-P2	CHEM-P3	CHEM-P4	CHEM-P5	CHEM-P6	CHEM-P7	CHEM-P8	CHEM-P9	CHEM-P10
	CHEM-P11	CHEM-P12	CHEM-P13	CHEM-P14	CHEM-P15	CHEM-P16	CHEM-P17	CHEM-P18	CHEM-P19	CHEM-P20
	CHEM-P21	CHEM-P22	CHEM-P23	CHEM-P24	CHEM-P25	CHEM-P26	CHEM-P27	CHEM-P28	CHEM-P29	CHEM-P30
	CHEM-P31	CHEM-P32	CHEM-P33	CHEM-P34	CHEM-P35	CHEM-P36	CHEM-P37	CHEM-P38	CHEM-P39	
MATH	MATH-P1	MATH-P2	MATH-P3	MATH-P4	MATH-P5	MATH-P6	MATH-P7			
	14.15-16.45 น.									
EDU	EDU-P1	EDU-P2	EDU-P3	EDU-P4	EDU-P5	EDU-P6	EDU-P7			
	14.15-16.45 น.									

ตารางเวลานำเสนอโปสเตอร์เพื่อให้ข้อมูลต่อคณะกรรมการตัดสินและผู้เยี่ยมชมผลงาน วันที่ 25 พฤษภาคม 2566 (ต่อ)

COM 14.15-16.45 น.	COM-P1	COM-P2	COM-P3	COM-P4	COM-P5				
PHY 14.15-16.45 น.	PHY-P1	PHY-P2	PHY-P3	PHY-P4	PHY-P5	PHY-P6	PHY-P7	PHY-P8	PHY-P9
	PHY-P11	PHY-P12	PHY-P13	PHY-P14	PHY-P15	PHY-P16	PHY-P17	PHY-P18	PHY-P19
	PHY-P20	PHY-P21	PHY-P22	PHY-P23	PHY-P24	PHY-P25	PHY-P26	PHY-P27	PHY-P28
INNO 14.15-16.45 น.	INNO-P1	INNO-P2	INNO-P3	INNO-P4	INNO-P5	INNO-P6	INNO-P7	INNO-P8	INNO-P9
R2R 14.15-16.45 น.	R2R-P1	R2R-P2	R2R-P3	R2R-P4	R2R-P5	R2R-P6	R2R-P7	R2R-P8	

ข้อปฏิบัติในการนำเสนอ

1. การติดตั้งโปสเตอร์สามารถติดตั้งได้ตั้งแต่วันที่ 24 พฤษภาคม 2566 (เวลา 13.00 น. – 17.00 น.)
2. การจัดแสดงโปสเตอร์ต้องจัดแสดงไว้ทั้ง 2 วัน (วันที่ 25 - 26 พฤษภาคม 2566)
3. ผู้นำเสนอโปสเตอร์จะต้องอยู่ประจำโปสเตอร์ในวันที่ 25 พฤษภาคม 2566 ในช่วงเวลา 14.00 - 17.00 น. โดยนำเสนอตามตารางเวลานำเสนอโปสเตอร์เพื่อให้ข้อมูลต่อคณะกรรมการตัดสินและผู้เยี่ยมชมผลงาน
4. ผู้นำเสนอสามารถเก็บโปสเตอร์ได้ วันที่ 26 พฤษภาคม 2566 ตั้งแต่เวลา 14.00 - 15.00 น.

หมายเหตุ: มีการพิจารณาและให้รางวัลการนำเสนอผลงานวิจัยภาคโปสเตอร์

25-26 พฤษภาคม 2566		<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.เนรัฐชลา สุวรรณคนธ์	มหาวิทยาลัยพะเยา	
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.ลออรัตน์ พัวพิทยาเลิศ	มหาวิทยาลัยพะเยา	
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.กนกกาญจน์ พรหมน้อย	มหาวิทยาลัยพะเยา	
รหัส	ชื่อเรื่อง	ผู้นำเสนอ	
BIO-P1	Differences of ischemic and ischemia/reperfusion injury related protein damage-associated molecular pattern (DAMPs) in cardiac cell subjected to an <i>in vitro</i> simulated ischemia/reperfusion injury.	สรารุช คำปวน	
BIO-P2	Expression of age-related microRNAs in venous blood	ปวีณา มุกดา	
BIO-P3	LPS-stimulated vascular endothelial cell injury related Damage-Associated Molecular Pattern (DAMPs) expression	พรรณณยุพา ปานคง	
BIO-P4	Cardiac microvascular endothelial-associated protein Damage-associated Molecular Pattern (DAMPs) expression in ischemia and ischemia/reperfusion injury	นิธิรัตน์ เนินเพิ่มพิสุทธิ์	
BIO-P5	Change of exosomal miR-146a expression in blood affects to inflammatory cytokines production by regulating via TRAF6 and IRAK1 of pediatric SLE following treatment	อัญมณีย์ ศรีชัยมงคล	
BIO-P6	Development of Texture-Modified Barbecued Red Pork in Sauce with Rice for Post-Stroke Patients with Dysphagia	ธีรุตม์ อุ้มปรีชา	
BIO-P7	Characterization of breast cancer stem-like cells derived from MDA-MB-231, a triple-negative breast cancer cell	ณัฐณิชา รังสิยานนท์	
BIO-P8	Expression profiles of cluster of differentiation 47 and calreticulin in breast cancer tissues and cell lines	จุฑามาศ จันทระอัมพร	
BIO-P9	Genetic variants of the phenylalanine hydroxylase gene in Thai Patients with Phenylketonuria	ลักขณา จิวสระ	
BIO-P10	Effect of health-related fitness and arterial stiffness on smokers: comparison of exercise and non-exercise	Yueji Tanaka	

25-26 พฤษภาคม 2566

Session Poster Presentation

BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง
วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ
จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี
ทางอาหาร

Committee 1	ผู้ช่วยศาสตราจารย์ ดร.มณฑล เลิศวรปรีชา	มหาวิทยาลัยทักษิณ
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.กฤษชัย พูลเจริญ	มหาวิทยาลัยพะเยา
Committee 3	ดร.กนกทิพย์ เพชรรัตน์	มหาวิทยาลัยพะเยา

รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P11	Development of anti-bacterial and anti-cancer peptides from the helminth defense molecule of the liver fluke <i>Opisthorchis viverrini</i>	กมลรัตน์ กองพา
BIO-P12	Development of Chicken IgY-based Indirect ELISA for detect <i>Opisthorchis viverrini</i> antigen in feces	Sokuntheary Oeurn
BIO-P13	Molecular characterization and functional analysis of the <i>Opisthorchis viverrini</i> calpain	Sunheng Kaing
BIO-P14	Elucidating the hepatotoxic mechanism of the insecticide fipronil in human hepatocellular carcinoma cells using the proteomic approach	พิชามนชู้ เพ็ชรฉวาง
BIO-P15	Cigarette smoke extracts induces lung epithelial cell death and alters lung secretomes expression	พรธเนศ สีนาค
BIO-P16	Proteomic-based study of the neurotoxic mechanism of the insecticide fipronil in a human neuroblastoma cell line	เกรียงศักดิ์ เลิศประภามงคล
BIO-P17	Semi-solid and 3D cultures render the chemoresistance in A549 human lung cancer cells	ศิริพร กิรติจำเริญ
BIO-P18	Cello-oligosaccharide production by enzymatic hydrolysis of young longan	กัญญาภัค ฉางข้าวไชย
BIO-P19	Antioxidant activity of osmotic-dehydrated of pineapple containing teas (<i>Camellia sinensis</i>) and herbs	ปรีศนีย์ กองวงศ์
BIO-P20	Design and development of database of food-derived bioactive peptides with anti-inflammatory activity	ปรียาพร ทับแก้ว
BIO-P21	Total protein content of commercial Bee pollen from Northern Thailand	เพ็ญนภา พาอ้อ

25-26 พฤษภาคม 2566	<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	รองศาสตราจารย์ ดร.สิทธิชัย ปัญญาใส	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.กานต์รวี ขยัน	มหาวิทยาลัยพะเยา
Committee 3	อาจารย์รุ่งทิพย์ ทองบุญโท	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P22	Comparative study of antibacterial activity on skin pathogens of extracts from <i>Stevia rebaudiana</i> Bertoni leaves	ฉัญลักษณ์ ตริเทรา
BIO-P23	Antimicrobial activity on skin pathogens of ethanolic extract from spent leaves of <i>Stevia rebaudiana</i> Bertoni	พัชรินทร์ กลิ่นเพชร
BIO-P24	Antipathogenic bacteria activity of Lactobacillus isolated from native swine feces	กิตติยา คงกุล
BIO-P25	The evaluation of potentials of lichens <i>Parmotrema tinctorum</i> (Despr. Ex Nyl.) hale crude extract against biofilm formation in some species of pathogenic bacteria	อารีรัตน์ ไส่ส่อง
BIO-P26	Efficacy of <i>Mimosa pudica</i> L. and <i>Asystasia gangetica</i> (L.) T. Anderson. extracts on inhibition to <i>Fusarium</i> sp. isolated from longan leaves	วิภาวรรณ นันโท
BIO-P27	Effects of organic acids for inactivating <i>Escherichia coli</i> O157:H7 and <i>Staphylococcus aureus</i> on tile	ศิริพร คำปิ่น
BIO-P28	Study on efficiency of <i>Phellinus gilvus</i> (Schwein.) pat from fruiting body with ethanolic and aqueous crude extracts to inhibit <i>Staphylococcus epidermidis</i> and <i>Escherichia coli</i>	อรทัย เสริฐศรี
BIO-P29	Effect of co-culture of <i>Acetobacter pasteurianus</i> AJ 605 and <i>Saccharomyces cerevisiae</i> var. <i>boulardii</i> on chemical qualities and antioxidant activities of kombucha	อภิทิพย์ สุขใส
BIO-P30	Antibiotic resistant bacteria in mangrove forests in the eastern Thailand during years 2020-2022	นัยนา ชาติวิสัย
BIO-P31	Study of Fermented Cassava Pulp with <i>Saccharomyces cerevisiae</i> to Increase the Amount of Protein in Concentrated Food for Cattle	เทพกร ลีลาแต้ม

25-26 พฤษภาคม 2566	<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.กัญญาณัฐ สุนทรประสิทธิ์	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.พนิตนาฏ อู่พุดินันท์	มหาวิทยาลัยพะเยา
Committee 3	อาจารย์ธันยาภรณ์ ตั้งเจริญชัย	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P32	Effect of spent coffee grounds with rubber wood sawdust substrates on the mycelial growth and primordial formation of <i>Agrocybe cylindracea</i> Maire	วราภรณ์ แก้วคอน
BIO-P33	Isolation and characterization of exopolysaccharide produced from bacteria in freshwater fish intestine	กรรณิการ์ บุญแก้ว
BIO-P34	Diversity of fungi isolated from <i>Nelumbo nucifera</i> , Bung Tung Ka-Lo, Uttaradit Province	กชกร ลามมาก
BIO-P35	Isolation of high lead-tolerant fungi from the public dumping site and immobilization on biochar for biosorption capacity	พิมพ์ประภา ชัยจักร
BIO-P36	Isolation and identification of ammonia and nitrite removing bacteria from Nile tilapia pond	ฉัญญลักษณ์ พิมพ์สาลี
BIO-P37	Isolation of Trichoderma from soil sample of the Arabica coffee plantation at Doi Pang Khon, Chiang Rai Province	สมบูรณ์ คำเตจา
BIO-P38	Screening of cellulase, pectinase and phytase producing bacteria from honey and stingless bee honey	สุมัยยะฮ์ ยาประจัน
BIO-P39	Screening of Gamma Aminobutyric Acid (GABA) and anti-oxidant producing Bacillus isolated from the honey of bees and stingless bees	เบญญาภา ประกิจ
BIO-P40	A survey of Actinomycetes in mangrove forests in the upper gulf of Thailand	ภาณุพงษ์ ชมมี
BIO-P41	Effect of sodium nitrate reduction on sunscreen formation in cyanobacterium <i>Lyngbya</i> sp.	นิตยา ไชยเนตร

25-26 พฤษภาคม 2566	<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.อาทิตย์ นันทขว้าง	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.เนติ เงินแพทย์	มหาวิทยาลัยพะเยา
Committee 3	ดร.ชฎานันท์ จิตมณี	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P42	The study of waste oil absorption using chitosan mixed with coconut husk sheet	พิชญา ศรีอุทัยศิริวงศ์
BIO-P43	Bioremediation of contaminated diesel and bioelectricity generation using marine bacterial consortium integrated with microbial fuel cell	ปาณิสรา มีชู
BIO-P44	Above-ground biomass of the community forest in Chiang Rai province: A case study of Ban Rong Khue community forest	ธเนศ เยอส์อ
BIO-P45	Study and design of appropriate sewage methods in KMUTT Bang Khun Thian	สุกนตรี สุรเจริญใจ
BIO-P46	Organic carbon content in seagrasses bed, Koh Kood, Trat Province	จรรย์วดี สุริยพันธุ์
BIO-P47	The simulation of circulation and contaminant distribution in seawater in the offshore shellfish culture areas in Sriracha District, Chonburi Province	อนุกุล บุรณประทีปรัตน์
BIO-P48	Study of nutrient contents in vermicomposts produced by the african nightcrawler (<i>Eudrilus eugeniae</i>)	ชนิษฐา โถยะโล
BIO-P49	Analysis of rice growth from physiological monitoring and green excess index using digital photographs	จุฑารัตน์ ทองใบ
BIO-P50	Database of local plants in Eastern Floristic Region in RSPG-Burapha	พิชญากร ทุมวงศ์

25-26 พฤษภาคม 2566	<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	รองศาสตราจารย์ ดร.ฐานา ชลธนานารถ	มหาวิทยาลัยศรีนครินทรวิโรฒ
Committee 2	รองศาสตราจารย์ ดร.จตุพร ตั้งจิตวิทยากุล	มหาวิทยาลัยพะเยา
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.ทิพย์วรรณ สรรพสัถย์	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P51	Fish diversity and feeding habits of <i>Channa gachua</i> (Hamilton, 1822) in headwater stream in Pak Panang basin of Khao Pu - Khao Ya national park	ทิวาปกภู ปานโบว์
BIO-P52	Diversity of cave-dweller snail of the genus <i>Acmella</i> Blanford, 1869 in Thailand	กัญญมัทรี หมอยาดี
BIO-P53	Pupillid land snails (Pupillidae) diversity of Satun Province, Southern Thailand	จิรินทรา เชาว์ชอบ
BIO-P54	Diversity of Hypselostomoid Micronails in the Western Region of Thailand	กัญญา สีสดี
BIO-P55	Species diversity of family Diplommatinidae in satun province	สุภัคชกร ประดาสุข
BIO-P56	Microanatomy of the kidneys and sexual segment of the kidney of male Banded Krait <i>Bungarus fasciatus</i> (Schneider, 1801)	อัคนี ผิวหอม
BIO-P57	A comparison of life cycle and nutritional content in black soldier fly larvae reared on different diets	เกศราภรณ์ จันทน์ ประเสริฐ
BIO-P58	A novel preparation of an anesthetic derived from jasmine essential oils (<i>Jasminum officinale</i> L.) for use in zebrafish (<i>Danio rerio</i> (Hamilton, 1822))	ณัฐนิชา รื่นถ้อย
BIO-P59	Development of larvicide product from bacteria for controlling of insecticide resistant <i>Aedes aegypti</i> larvae	ดนาพร สารพฤกษ์
BIO-P60	Defatting processes affected on physical and functional properties of selected cricket powder in Thailand	ณัฐณิรินทร์ บุรณะสระแก้ว

25-26 พฤษภาคม 2566		<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>
Committee 1	รองศาสตราจารย์ ดร.ภพแก้ว พุทธิรักษ์	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.บุญฤทธิ์ สิ้นค้างาม	มหาวิทยาลัยพะเยา
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.สุกัลยา ภู่อทอง	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P61	Comparative stem anatomy of some aquatic plants in Phayao province	สุจิรา นนทิตบุตร
BIO-P62	A comparative study on three Thai <i>Cassia</i> L. (Fabaceae) species	ศกุลธิดา นิลแก้ว
BIO-P63	Study on leaf epidermal anatomy, life cycle, and phytochemical screenings of Kratai Cham (<i>Adenosma indianum</i> (Lour.) Merr.) in salinity areas	วรพร เหล่าจินดา
BIO-P64	Effect of medium and organic components on growth and development of <i>Bulbophyllum cauliflorum</i> Hook.f. <i>in vitro</i> seedlings	อนุพันธ์ กงบังเกิด
BIO-P65	The effect of various culture media on the growth and development of <i>Bulbophyllum dayanum</i> Rchb.f. seedlings in <i>in vitro</i> culture	บวร คุณากรนุรักษ์
BIO-P66	The effect of media on the growth of <i>Rhynchosytilis gigantea in vitro</i>	ธัญวดีณ์ ศฤงคาร
BIO-P67	Effect of light and medium components on growth and development of <i>Dendrobium draconis</i> Rchb.f. <i>in vitro</i> seedlings	ธนากร วงษ์ศา
BIO-P68	The effect of soil substrates and seed treatment on <i>Coffea arabica</i> L. seed germination	สมฤทัย ต้นมา
BIO-P69	Effects of plant media leonadite on growth of green cos lettuce seedling (<i>Lactuca sativa</i> L. var Longifolia)	นันทน์ภัส รุ่งทัน
BIO-P70	Assessment of genetic relationships among <i>Cryptocoryne</i> species using SCoT markers in the Mekong River region of Loei and Nong Khai Provinces	วัชรินธรณ์ สีสด

25-26 พฤษภาคม 2566	<p>Session Poster Presentation</p> <p>BIO: สาขาวิชาชีววิทยาและการประยุกต์ วิทยาศาสตร์การประมง วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์เทคโนโลยีชีวภาพ วิทยาศาสตร์และเทคโนโลยี ทางอาหาร</p>	
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.บุญช่วง บุญสุข	มหาวิทยาลัยพะเยา
Committee 2	ดร.รวิสร่า รื่นไวย	มหาวิทยาลัยพะเยา
Committee 3	ดร.อโนชา สุขสมบูรณ์	มหาวิทยาลัยบูรพา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
BIO-P71	Effects of addition of <i>Trichoderma asperellum</i> powder in potting soil containing organic fertilizer for growth promotion in tomato seedlings	อนุเทพ ภาสุระ
BIO-P72	Design and Development of database of antioxidants-rich natural fruit and vegetable	อัญชลี ทรัพย์อุดม
BIO-P73	Exploring the indigenous <i>Trichoderma</i> sp. and its biocontrol potential against phytopathogenic fungi	ภูมิน นุตרתัด
BIO-P74	Asparagus preservation method for small-scale farmers	โสภิตา ศรีวิลัยวรรณ
BIO-P75	The effect of retail packaging on quality and shelf life of chinese pork sausage product	วิษะณี เหนือเมฆิน
BIO-P76	Effect of xanthan gum on the qualities of brown rice cookies addition with pineapple Pomace	อรทัย บุญทะวงศ์
BIO-P77	The study of quality of set-type yogurt during storage	พรธีรา รัตน์รัตน์
BIO-P78	Study on the efficiencies of gelling agents in the production of coffee gummy	พัชรารินทร์ เรือนโต
BIO-P79	Study on the efficacy of kitchen mint (<i>Mentha x cordifolia</i> Opiz ex Fresen) and lemongrass (<i>Cymbopogon nardus</i> (L.) Rendle) leaf extracts against mealybugs	จารุพร อุปชิน
BIO-P80	Study on the biological activity of extracts from <i>Ocimum tenuiflorum</i> and <i>Coccinia grandis</i> (L.) Voigt as natural insecticides against mealybugs	กิติพร สี่ไวย

25-26 พฤษภาคม 2566

Session Poster Presentation

CHEM: สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม

Committee 1	ดร.วิญญา ดุงแก้ว	มหาวิทยาลัยมหาสารคาม
Committee 2	ดร.ผกาสุคนธ์ เมฆรัตน์ชัย	มหาวิทยาลัยพะเยา
Committee 3	ดร.ธนิษฐา เสมอใจ	มหาวิทยาลัยพะเยา

รหัส	ชื่อเรื่อง	ผู้นำเสนอ
CHEM-P1	Synthesis of CuO by Cyclic Microwave and Application as Photocatalyst	พงศภัค ฝนมณี
CHEM-P2	Green synthesis of 3,4-dihydropyrimidinone derivatives and biological activity studies	ศิรินยาธร พงศ์นุช
CHEM-P3	α -glucosidase inhibitory activity of alkaloid extract from leaf of <i>Mitragyna speciosa</i> (Korth.) Havil.	ภราดร แก้วสุวรรณ
CHEM-P4	Development of AgMn _x O _y /C and MnO _x /C as cathode catalysts for glucose alkaline fuel cell	สุพรรณษา ดำพัฒน์
CHEM-P5	Development of AgVO _x /C, AgMnO _x /C as cathode and PdCeO _x /C as anode catalysts for sorbitol alkaline fuel cell	พิณทิรา ช่วยบุญชู
CHEM-P6	Synthesis of reversible thermochromism of polydiacetylene/zinc(II) ion/ zinc oxide nanocomposites in mixed water/propanol: Effect of solvent ratios	รัตยาภรณ์ โพธิ์ใต้
CHEM-P7	Synthesis of Tritly Dithiocarbamate Epoxy-Andrographolide Analogues	พรรัชชล อินทะมาลี
CHEM-P8	Synthesis of 4-methoxycinnamyl p-coumarate analogues via esterification reaction and their structure-activity relationship.	ประภากร สมบุญมาก
CHEM-P9	Synthesis of Colletotryptin A and B	วิไลลักษณ์ แซ่แต้
CHEM-P10	Photocatalytic reduction of CO ₂ to methanol by Cu/ZnO-CeO ₂ nanoplate catalyst	อัครเดช โชตนิธิสุวรรณ

25-26 พฤษภาคม 2566		Session Poster Presentation
		CHEM: สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม
Committee 1	ดร.พรทิพย์ บุญศรี	มหาวิทยาลัยศรีนครินทรวิโรฒ
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.พิทักษ์ นาสมใจ	มหาวิทยาลัยพะเยา
Committee 3	ดร.สุทธาสินี กัตัญญ	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
CHEM-P11	The development of biodiesel quality oil from blending waste cooking oil with animal fat and castor seed oil	นพรัตน์ โคตรสุโน
CHEM-P12	Preparation of piper betle Linn. extract and MgFe-layered double hydroxide composite by solid-solid reaction	กุลนิษฐ์ อินทรเพชร
CHEM-P13	Development of composite material based on <i>Glycyrrhiza glabra</i> extract and MgFe-layered double oxide by solid-state reaction and antioxidant property	ณัฐนิดา นาคเกลี้ยง
CHEM-P14	Green one pot synthesis of 3,4-dihydropyrimidinone analogues using celite catalyst	วรมน พลอยยอดศรี
CHEM-P15	RGB-based quantitation method of ethambutol dihydrochloride for the quality control of tablets	ธีรศักดิ์ โรจนราชา
CHEM-P16	Speciation and quantification of inorganic phosphate additive in frozen shrimp by 31P-NMR	สรายุทธ เวชสิทธิ์
CHEM-P17	Effect of alginate amount on properties of edible film from radish.	สาธินี ภูนาเมือง
CHEM-P18	Design and synthesis of benzimidazole - triazole derivatives via sequential one-pot three step reaction	พิชามณูช มาศงูเหลือม
CHEM-P19	Molecular docking study of quinoline derivatives with lysozyme in silico	นฤมล เพชรรัตน์
CHEM-P20	Linear and nonlinear regression methods for optimum methylene blue adsorption isotherm onto synthesized activated carbon from coffee grounds impregnated with calcium alginate bead	อภิสิทธิ์ อินตะชัย

25-26 พฤษภาคม 2566		Session Poster Presentation	
		CHEM: สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม	
Committee 1	ดร.ภาคิน นพวรรณ	มหาวิทยาลัยมหาสารคาม	
Committee 2	ดร.กุลวดี ดลโสภณ	มหาวิทยาลัยศรีนครินทรวิโรฒ	
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.บัลวี ยศน้อย	มหาวิทยาลัยพะเยา	
รหัส	ชื่อเรื่อง	ผู้นำเสนอ	
CHEM-P21	Pulse Electric Assisted Extraction of Pinostrobin-enriched extract from Finger Root Rhizome (<i>Boesenbergia rotunda</i> (L.))	ธนิต เมธีบุญกุล	
CHEM-P22	Study of the ratio between virgin coconut oil and shea butter on the properties of skin care lotion	ธนิต เมธีบุญกุล	
CHEM-P23	Simplified removal of heavy metal wastewater: MgFe-layered double hydroxide approach for Cr ⁶⁺ treatment	Soraida Bosoy	
CHEM-P24	The investigation of physicochemical properties of the Roselle (<i>Hibiscus sabdariffa</i> Linn.) seed oil	สันติ พิฆัง	
CHEM-P25	Removal of methylene blue dye using adsorbent prepared from sugarcane bagasse	กัลยาณี กางสันเทียะ	
CHEM-P26	Activated carbon from jarul fruit (<i>Lagerstroemia speciosa</i> Pers.) by chemical activation with H ₃ PO ₄	ชุตติกาญจน์ อินจันทร์	
CHEM-P27	Effect of temperature on properties of activated carbon from waste bamboo chopsticks prepared from phosphoric acid.	เพชรศิริ พ่วงขำ	
CHEM-P28	Develop of ethylene absorbent paper from leaf sheaf banana containing activated carbon and titanium dioxide	สุรัสวดี ปลิวโพธ	
CHEM-P29	Adsorption of hydrogen sulfide in biogas using alkaline impregnated <i>Echinodorus cordifolius</i> biochar as an adsorbent	สุรารัตน์ ศิริอินทร์	
CHEM-P30	Adsorption efficiency of decanter cake and decanter cake biochar for removing hydrogen sulfide from biogas	นาชติญา คงแก้ว	

25-26 พฤษภาคม 2566		Session Poster Presentation CHEM: สาขาวิชาเคมี เคมีประยุกต์ และเคมีอุตสาหกรรม
Committee 1	รองศาสตราจารย์ ดร.ปิยะเนตร จันทร์ถิระติกุล	มหาวิทยาลัยมหาสารคาม
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.นฤมล เสถียรยะ	มหาวิทยาลัยพะเยา
Committee 3	ดร.พัชกรวิภา เชาว์พานิช	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
CHEM-P31	ZnO Photocatalyst Supported on Cellulose Extracted from Sugarcane Bagasse for Methylene Blue Removal by Filtration under Visible Light	เสาวภา โชติสุวรรณ
CHEM-P32	Developing composite catalyst: Layered double oxide@activated carbon by solid-solid method	ศรชัย อินทไชย
CHEM-P33	Utilization of ZnAl-layered double hydroxide and ZnAl-layered double oxide as adsorbent for remediating dye-wastewater	วชิรญาณม์ ทิพย์รส
CHEM-P34	Nanocellulose as a green template in the preparation of Al-doped mesoporous silica catalysts for glucose conversion to 5-HMF	ปานัสม์ แซ่ลี
CHEM-P35	Magnetic MgFe-layered double oxide as the absorbent for removing Congo red and eriochrome black T dyes	กรองเนตร สังข์ทอง
CHEM-P36	Physical and chemical properties of cellulose from novacetimonas pomaceti isolated from kombucha	รุ่งระวี ไชยยอด
CHEM-P37	Development of air cathode electrode for a membraneless alkaline fuel cell prototype	จักรพงศ์ ไชยบุรี
CHEM-P38	Silver and silver alloy on carbon-supported catalysts for cathodes in PEMFC and DEFC	ศิวัช ตั้งประเสริฐ
CHEM-P39	Photocatalytic activity of mixed metal oxide of cupric oxide/ferric oxide/zinc oxide synthesized by microwave method	ณัฐธำ อินทรไย

25-26 พฤษภาคม 2566		Session Poster Presentation	
		MATH: สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์ สาขาวิชาสถิติ	
Committee 1	รองศาสตราจารย์ ดร.ประสิทธิ์ ช่อลำเจียก	มหาวิทยาลัยพะเยา	
Committee 2	ดร.เพชร ใจโลกา	มหาวิทยาลัยพะเยา	
Committee 3	ดร.ลภัสสรดา สิงห์สมบูรณ์	มหาวิทยาลัยบูรพา	
รหัส	ชื่อเรื่อง	ผู้นำเสนอ	
MATH-P1	The method for solving variational inequality problem and applying to fixed-point problem of nonexpansive mapping	อนุชา นัยสมัน	
MATH-P2	Approximation theorem for fixed point problem and modification of variational inequality problem	พิมพ์วีณ์ ชุมทรัพย์	
MATH-P3	Proving that the potential infinite series cannot be the variables by determining the amount of odd and even terms in the potential infinite series and substitute into the equation	ภัสร์พสุ รุ่งฉัตร	
MATH-P4	The development of a web application based on a mathematical model describing the propagation of COVID-19 in Thailand: a case study for the 5 th wave	สุพิชฌาย์ วงศ์กมลลาไสย	
MATH-P5	A Predator – Prey Model: A Case Study of Lady Beetles and Mealybugs in Agriculture	อาริชา อุ๋นเรื่อน	
MATH-P6	The correlation between Financial Ratios and Stock Price of Charoen Pokphand Group Companies Listed on the Stock Exchange of Thailand	นภสร ควรอาจ	
MATH-P7	Alternative Selecting the Demonstrating Schools of School of Education Student, University of Phayao using Decision Making Problems	กุลธิตา คำสุก	

25-26 พฤษภาคม 2566		Session Poster Presentation
		EDU: สาขาวิชาวิทยาศาสตร์ศึกษา และคณิตศาสตร์ศึกษา
Committee 1	รองศาสตราจารย์ ดร.รักษิต สุทธิพงษ์	มหาวิทยาลัยพะเยา
Committee 2	ดร.วิภาวี ศิริลักษณ์	มหาวิทยาลัยพะเยา
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.มณีนทร รัักษ์บำรุง	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
EDU-P1	The effect of agility training for exercise and sports science students in the futsal course	ธนัชพร ใจจุมปา
EDU-P2	Effects of research based learning with flipped classroom on critical thinking and learning achievement in chemistry of grade 12	อภิรดี พันธุ์สิงห์
EDU-P3	Administration of STEAM Education Learning through Creativity-based learning for encouraging to Competency & Skills in the 21 st Century for Secondary 1 students	สุชานันท์ แดงจันทร์ตา
EDU-P4	Detection of <i>Vibrio</i> spp. in a closed system saltwater fish tank from the Institute of Marine Science, Burapha University.	ธวัชรรัตน์ ชุ่มศรี
EDU-P5	Development of Science Process Skills by Using Inquiry-Based Learning (5E) Together with Questioning Techniques in Photosynthesis Study Unit for Junior High School Students	พัชราภา คงมัน
EDU-P6	Integrating Automatic Item Generation techniques with MS-Excel, Python and LaTeX to create dynamic animation worksheets focusing on a projectile motion.	ปิยะพงศ์ สิทธิสนธิ์
EDU-P7	The development of skills drills in cooperation with Inquiry-based learning management to promote the ability to solve chemical problems on title “Factors affecting Chemical Equilibrium” of the fifth grade of secondary level students	อโนดาช รัชเวทย์

25-26 พฤษภาคม 2566		Session Poster Presentation	
		COM: สาขาวิชาคอมพิวเตอร์ เทคโนโลยีสารสนเทศ วิทยาการข้อมูล	
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.เกรียงศักดิ์ เตมีย์	มหาวิทยาลัยนเรศวร	
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.สุรางคณา ระวังยศ	มหาวิทยาลัยพะเยา	
Committee 3	ดร.กนกวรรณ เชื้อเงิน	มหาวิทยาลัยพะเยา	
รหัส	ชื่อเรื่อง	ผู้นำเสนอ	
COM-P1	Management Online Examination System (UP LMS) Case Study Midterm and Final Examinations Online in the COVID-19 Pandemic Situation, University of Phayao	เพชร พงษ์เฉย	
COM-P2	The solution-sample manipulation uses programmable linear actuator for the well-plate colorimeter analysis	เอกบุญญา ศรีสุข	
COM-P3	The Rexpert: A system for clustering the research results of computer researchers with data mining techniques for recommending similar research results.	ชัยศิริ สนิทพลกลาง	
COM-P4	Construction of an AI Electronic Nose System for Characterization of a Coffee Aroma Map in Chiang Rai Province	ปริญญา สาเพชร	
COM-P5	Database of Natural Compounds and Potential Bioactivity of Dietary Supplement Products.	อริษา วรธงชัย	

25-26 พฤษภาคม 2566		Session Poster Presentation PHY: สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์
Committee 1	ดร.เริงฤทัย ศิริรักษ์	มหาวิทยาลัยพะเยา
Committee 2	ดร.พิมพ์ใจ แสงความสว่าง	มหาวิทยาลัยพะเยา
Committee 3	ดร.สิริกมล แสงมีอานุกาพ	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
PHY-P1	Development of meltblown nonwoven fabric with antibacterial activity by ZnO/AgBr nanocomposites coating	มาตา บุญเรืองลือ
PHY-P2	Comparison of surface microhardness of restorative resin composite with different types of fillers	นิโลบล วงศ์สายตา
PHY-P3	The color masking ability of resin composite with different types of fillers	กชรัตน์ นันทเสน
PHY-P4	Dielectric and improved energy-storage properties in complex perovskite $(1-x)\text{NaNbO}_3-x\text{Bi}(\text{Li}_{1/3}, \text{Sn}_{2/3})\text{O}_3$ lead-free ceramics	พาทิศ เปรมวิชิต
PHY-P5	Effects of Na excess on the Phase structure and Electrical Properties of $(\text{Bi}_{0.487}\text{Na}_{0.487}\text{K}_{0.06}\text{Ba}_{0.026})\text{TiO}_3$ Lead-free Piezoceramics	วันเฉลิม ไมตรีสิทธิกร
PHY-P6	Identification of Low-Temperature Heated Ruby Samples Using FTIR Spectra	อุมพร พลายระหาร
PHY-P7	Effects of Water-to-cement Ratio and Curing Time on the Electrical Output of Cement-based Triboelectric Nanogenerator	คณิศร แก้วศรีทอง
PHY-P8	Mechanical and Physical Properties of Cellular Lightweight Concrete Containing Bottom Ash	ทองศักดิ์ โนไชยา
PHY-P9	Study on structural, dielectric, and energy storage properties of Ba^{2+} doped lead-free NaNbO_3 -based ceramics	ศศิพร ประเสริฐपालิฉัตร
PHY-P10	Physical properties and thermal properties of concrete mixed with crushed stone	พลิศภัทร์ คำฟู

25-26 พฤษภาคม 2566

Session Poster Presentation

PHY: สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

Committee 1	รองศาสตราจารย์ ดร.วิรัชชา เครือฟู	มหาวิทยาลัยแม่โจ้
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.พจนศักดิ์ พงนา	มหาวิทยาลัยพะเยา
Committee 3	ผู้ช่วยศาสตราจารย์ ดร.อารักษ์ กลิ่นบำรุง	มหาวิทยาลัยพะเยา

รหัส	ชื่อเรื่อง	ผู้นำเสนอ
PHY-P11	X-ray Shielding and Mechanical Properties of Rubber compound/Barium sulfate Composite	สุทธิษา ก้อนเรือง
PHY-P12	Effect of firing temperatures on phase formation, microstructure, dielectric and magnetic properties of $Ni_{0.6}Zn_{0.4}Fe_2O_4$ ceramics synthesized by the solid-state combustion technique	ณัฐกมล สนชาวไพโร
PHY-P13	Firing temperatures effect on phase formation, microstructure, and electrical properties of BNBKL ceramics fabricated via the solid-state combustion technique	เมธาสิทธิ์ กลิ่นบ้านหม้อ
PHY-P14	Effect of firing temperatures on the phase formation, microstructure, and electrical properties of BCLTS ceramics	วิชญ สมศรี
PHY-P15	Effect of firing temperatures on phase structure, microstructure, electrical and magnetic properties of $(Bi_{0.5}Na_{0.5})_{0.7}La_{0.3}(Ti_{0.7}Fe_{0.3})O_3$ ceramics	ศุภรพรรณ ชูถิ่น
PHY-P16	Effect of firing temperatures on phase formation, microstructure, electrical, and energy storage properties of BNT-BT-BCTZ ceramics prepare via the solid-state combustion technique.	วิศรุต ทรงสถาน
PHY-P17	Enhancement of water resistance of cotton gauze by Ar- and He-cold plasma treatment	นลินประภา ศรีณย์วงศ์
PHY-P18	The use of waste tire rubber as sand replacement in mortar: effect on density, compressive strength and tensile strength of mortar.	ปัญชานันต์ ต่อกิตติกุล
PHY-P19	Phase formation, microstructure and electric properties of La^{3+} substitution in B-site of lead-free lead-free $BaTi_{0.91}Sn_{0.09}O_3$ ceramics	วิวรรธน์ พัฒนเกษม

25-26 พฤษภาคม 2566

Session Poster Presentation

PHY: สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์ และวัสดุศาสตร์

Committee 1	ดร.นิยม โส่งสิทธิ์	มหาวิทยาลัยพะเยา
Committee 2	ดร.ศุภกร จั่นเลน	มหาวิทยาลัยพะเยา
Committee 3	ดร.ชลธิชา กฤษณ์เพ็ชร	มหาวิทยาลัยพะเยา
Committee 4	ดร.วัชรราวุฒิ กฤตินธรรม	มหาวิทยาลัยพะเยา
Committee 5	ดร.สมฤทธิ อุ่นอ้าย	มหาวิทยาลัยพะเยา

รหัส	ชื่อเรื่อง	ผู้นำเสนอ
PHY-P20	Orbits of photon around the black hole with a light source	ณัฐวรรธน์ ราชภูร์เจริญดี
PHY-P21	Evolution of the background universe in DHOST theory with shift-symmetry	วิทยา ทิพย์อักษร
PHY-P22	Quantize fluxoid protection in an S-wave superconducting ring	จตุพร นิสัยชื่อ
PHY-P23	Development of sugar adulteration detection in fruit juice using cavity-ringdown spectroscopy technique	นิชธิมา เอื้อพูนผล
PHY-P24	Experimental study of heat capacity to minimize error in the first-year student physics laboratory	ศักดา เขื่อนรอบเขต
PHY-P25	The free fall experiment using image processing techniques	วศิน ทะสร้อย
PHY-P26	Biogas Technology Transfer from Livestock Manure in Ban Nongban, Tak Province	ยุธนา ศรีอุดม
PHY-P27	Effects of Drying Air Temperature and Drying Air Velocity On drying Kinetics Pepper using Fluidized Bed Technique	สังคม สัพโส
PHY-P28	Biomass briquettes from Expired Mushroom Spawn with Rice-straw	คชรัตน์ ภูซัง
PHY-P29	Drying Herbs with Vertical Cylindrical Solar Incubator	ณัฐศชา อินทร์ชูรัญ

25-26 พฤษภาคม 2566		Session Poster Presentation
INNO: สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์		
Committee 1	ผู้ช่วยศาสตราจารย์ ดร.สุริยาอุธ ประอ้าย	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.รักฤดี สารธิมา	มหาวิทยาลัยมหาสารคาม
Committee 3	ดร.โสมนัส สมประเสริฐ	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
INNO-P1	Energy Conservation Induction Motor for Rice Mill Bucket 2.2 kW	ไพโรจน์ จันทร์แก้ว
INNO-P2	Development of smart farming for organic crops management system	พิชญะ รัชผล
INNO-P3	Application of Thermoelectric in Chicken Egg Incubator by Controlled Internet of Thing	จักรพันธ์ ถาวรงามยิ่งสกุล
INNO-P4	Optimum Parameters for Drying Banana Slices Using Ceramic Plate Infrared Heating by Response Surface Methodology	อภิรักษ์ ชัดวิลาศ
INNO-P5	Efficiency of titanium dioxide and commercial coating on the inhibition of algal growth on concrete surface	นฤดี วรรณสาร
INNO-P6	Navigation for mobile robots using millimeter-wave radar	วิศิษฐ์ มั่งทศน์
INNO-P7	Development of Methodology for Indicate Efficiency of Oxygen Scavenger	รัชนีวรรณ กุลจันทร์
INNO-P8	Development of Dyes for Indicate Freshness of Seafoods	รัชนีวรรณ กุลจันทร์
INNO-P9	"Botanical Bomb Innovation" Phytocosmetic Innovative Product for Hair Care	สกุลรัตน์ เรือนมูล
INNO-P10	An innovative safety holder of the endotracheal tube for neonates with severe respiratory illnesses	นิตต์อลิน พันธุ์อุทัย

25-26 พฤษภาคม 2566		Session Poster Presentation R2R: Routine to Research
Committee 1	รองศาสตราจารย์ ดร.มนตรา พงษ์นิล	มหาวิทยาลัยพะเยา
Committee 2	ผู้ช่วยศาสตราจารย์ ดร.นรินทร์ นนทมาลย์	มหาวิทยาลัยพะเยา
Committee 3	อาจารย์ภัทรพงศ์ พึ่งงาม	มหาวิทยาลัยพะเยา
รหัส	ชื่อเรื่อง	ผู้นำเสนอ
R2R-P1	Adaptation of Rice Farmers in Agriculture 4.0 era : Case Study of Rice Farmers in Pado Sub-district, Mayo District, Pattani Province	สุชานาถ โปธิกุล
R2R-P2	ESPreL evaluation of chemical risk assessment in the Biochemical laboratory, School of Medical Sciences, University of Phayao	ปิยะวรรณ นันตาบุญ
R2R-P3	Morphology and Meiotic Chromosome Behavior of Oyster plant. (<i>Tradescantia spathaceae</i> Sw.)	กรกนก ไชยเสน
R2R-P4	Community innovation to increase the capacity for sustainable self-management on resource base in southern border provinces	ลาตีปะห์ ดอกแม
R2R-P5	Development of an undergraduate student admissions system, Faculty of Science, Mahasarakham University	ธีระศักดิ์ ชงยันต์
R2R-P6	Development of Young's modulus Apparatus of Metal Wires for Introduction Physics Laboratory Class	ปานิสรา ดีเสื่อ
R2R-P7	The Development of QR Code Technology to Support Audiovisual Work School of Information and Communication Technology University of Phayao	ภาณุวัฒน์ โลมากุล
R2R-P8	The Development of Laboratory Equipment Circulation System using Storestock program in Microbiology Laboratory of School of Medical Sciences	พรรณราย ภิบาลภักดี

Abstracts

Oral Presentation

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์

วิทยาศาสตร์การประมง

วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร

วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์

เทคโนโลยีชีวภาพ

วิทยาศาสตร์และเทคโนโลยีทางอาหาร

**The study on growth and biomass of Khao Dawk Mali 105 and RD6 :
Case study of non-irrigated paddy field, San Khong Sub-district,
Dok Kham Tai District, Phayao Province**

Dunyawat Tahwiang^{1,2}, Pimsiri Suwannapat^{1,2,*}, Montri Sanwangsri³, Mana Panya⁴,
Ronald Macatangay⁴, Titaporn Supasri⁴ and Kritchaya Issakul¹

Study on growth and biomass of Khao Dawk Mali 105 and RD6 in non-irrigated paddies field Dok Kham Tai District, Phayao Province in 2022 is a year that has accumulated a lot of rain and does not lack water. The objective of this study was to study the growth trend and biomass of KDML105 and RD6 in non-irrigated paddies field under no water shortage. It was found that the amount of precipitation throughout the growing season was 1337.1 mm, resulting in an average soil moisture content of 53.4%, which was sufficient for rice growth. The soil temperature at 20 cm depth and average air temperature throughout the growing season were 27.7 ± 2.3 and 25.9 ± 2.1 °C, in the range of good growth and high yield of rice. Regarding the growth of rice every 30 days, biomass of roots, stems and ears of KDML 105 were 6.8, 67.2 and 26.0 percent, respectively, and RD6 rice were 11.3, 53.8 and 34.9 percent, respectively. It was found that RD6 gives a higher proportion of ears than KDML 105 rice by 8.9 percent. By 2022, the yield and purchase price of KDML 105 rice is at 776.1 kg/rai, the price is 11.40 baht/kg, while RD6 rice is at 800 kg/rai. And the price at 10 baht/kg, which is 1.40 baht cheaper than KDML 105 rice, although RD6 rice has a higher yield/rai, but the purchase price is cheaper. As a result, farmers prefer to plant KDML 105 rice rather than RD6 rice because KDML 105 rice has a higher purchase price and purchase market, resulting in KDML 105 rice being easier to sell.

Keywords: Khao Dowk Mali 105, Non-irrigated paddy, RD6, Rice biomass

¹ Environmental Science, School of Energy and Environment, University of Phayao, Phayao, 56000

² Micrometeorology Laboratory Research Group (MiLab), School of Energy and Environment, University of Phayao, Phayao 56000

³ Department of Highland Agriculture and Natural Resources, Faculty of Agriculture, Chiang Mai University 50200

⁴ Atmospheric Research Unit, National Astronomical Research Institute of Thailand, Chiang Mai, 50180

* Corresponding author email: aj.pimsiri@gmail.com

Preliminary yield trial evaluation of waxy corn hybrids in Phayao

Suriyasak Auntan^{1,*} and Bunyarit Sinkangam¹

University of Phayao maize improvement (UPMI) project was set up to develop high yielding maize varieties which suitable cultivation for the upper northern region. Fourteen lines of maize were selected and fertilized, then crossed between line and three tested strians including UPT1 UPT2 and UPT3 with a total of 42 preliminary single hybrids- A comparative yield trial evaluation between 42 preliminary single hybrids with 4 commercial varieties was conducted and recorded. The experiment was performed using randomized complete block design with two replications. Filed trial experiment was conducted during the rainy season of 2022 at the School of Agriculture and Natural Resources University of Phayao. The result showed that tasseling and silking were observed and recorded after 47 – 53 days and 47 – 54 days, respectively. In consideration to the economic yield characters, UPW 42 was the best of both green and white weights (2,743 and 1,714 kg per ria). Moreover, ear length, tip length and ear width averaged about 15.0, 12.1 and 3.7 cm, respectively. In addition, the percentage cutting of UPW 5 were high about 81.0%, In addition, the foliar diseases evaluation Downy Mildew, Northern Corn Leaf Blight, Southern Corn Leaf Blight, Corn Rust, results showed that all crossed hybrids had foliar disease incidence equal to 1.0, 1.0, 1.5 and 1.4 points, in assessing the eating quality, all couples were mixed with an average of 3.4 points.

Keywords: Hybrids, Waxy corn, Yield trial evaluation

¹ Agriculture science, School of Agriculture and Natural Resources, University of Phayao, Phayao 56000, Thailand

* Corresponding author email: suriyasak.auntan@gmail.com

Advance yield trial of maize hybrids integrating of public institutes in Phayao and Lampang

Jenjira Thamklang^{1,*} and Bunyarit Sinkangam²

The objective of this experiment was Advance Yield Trial trials for promising field corn hybrids in dry season 2021. total of 20 hybrids. The operation trial was planted comparative with commercial varieties in 2 provinces; Phayao and Lampang. Meanwhile, the field plot number was 3 plots. The data was recorded Dokkhamtai District, Phayao Province the top crosses with the highest yield were UPFC027xKi60 yielding 1,976 kg/rai. While comparative varieties average were 1,442 kg/rai. Chiang Muan District, Phayao Province the top crosses with the highest yield were UPFC005xKi60 which yielded 1,886 kg/rai. While comparative varieties average were 1,407 kg/rai. and in Muang District, Lampang Province the top crosses with the highest yield were UPFC005xKi60 which yielded 1,908 kg/rai While comparative varieties average were 1,407 kg/rai. 1,807 kg/rai. the comparative varieties were averaged 1,557 kg/rai. From the results of this experiment, it was possible to know the trend of strains with great potential. And continue to create good hybrids for use in the test planting at the On-Farm level.

Keywords: Advance yield trial trials, Field corn, Hybrid

¹ Master of Science Program in Agricultural Science, School of Agriculture and Natural Resources, University of Phayao, Phayao 56000

² Faculty of Agriculture and Natural Resources, University of Phayao, Phayao 56000

* Corresponding author email: jenjirathamklang@gmail.com

Preliminary yield trial of field maize hybrids in Phayao Province

Yuong Vorn^{1,*} and Bunyarit Sinkangam¹

Field trial of hybrid maize under the maize breeding project of University of Phayao to select suitable varieties for the area in the upper northern region. Preliminary yield trial testing of 112 crossed pairs together with 8 comparison varieties was planted and Lattice square design was plotted and recorded data was calculated using statistical analysis. The results found that the top 5 highest yield of crossed pairs were received in UP45 x Ki57 (1,973), UP42 x Kei1615 (1,869), UP34 x Kei1723 (1,729), UP34 x Kei1614 (1,704) and UP60 x Kei1611 (1,628 kg/rai), respectively. An average yield of these 5 top highest yield was 1,780 kg/rai. However, the top 5 highest of comparable varieties were Pac339 (1,831), S7328 (1,767), NS5 (1,643), GT200 (1,283), and P4546 (1,214 kg/rai), respectively. An average yield of these comparable varieties was 1,548 kg/rai. The selected mixed pairs were chose to test at the Advance Yield Trial level in the following season.

Keywords: Hybrid, Maize, Yield Trial

¹ Master of Science Program in Agricultural Science, School of Agriculture and Natural Resources, University of Phayao, Phayao 56000

¹ Faculty of Agriculture and Natural Resources, University of Phayao, Phayao 56000

* Corresponding author email: yuongbut@gmail.com

Effects of the light types on growth and yield quality of cherry tomato cultivars sweet girl

Jeerasak Meerod^{1,*}, Piengpim Chidburee¹, Siripun Sarin² and Aphichat Chidburee³

This research aimed to study the effect of light types on the growth and yield quality of Sweet Girl cherry tomatoes for planting in a plant factory system. A completely Randomized Design (CRD) was planned. There were 4 treatments with 6 replications each. Treatment 1 was the sunlight, planting done during October 2022 - February 2023 between 7.00-12.00 hrs with an average light intensity of about 250-1,860 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$ (control). Treatment 2 and 3 were the light came from A.E.E growth light LED model APL-100RBWUI 300W (consisting of red light (R; Red) 620-630 nm, blue light (B; Blue) 455-465 nm, color light. White (W; White) 6000-6500K, UV light (UV; Ultraviolet) and infrared light (IR; Infrared) 730-735 nm) (R+B+W+UV+IR) with light intensity of 315 and 78 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$. Treatment 4 was a white light LED (W; White). 6500K Model T5 4 W 300 Luman with the light intensity of 21 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$. The experimental results showed that after six weeks of cultivation, the growth of plants exposed to the R+B+W+UV+IR light intensity of 315 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$ was not different from that given to the sunlight followed by the cultivation of R+B+W+UV+IR light intensity of 78 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$ had the least growth. For the quality of the early yield, planting in the sunlight and the color light of R+B+W+UV+IR light intensity of 315 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$ achieved the first flowering date on 44.71 \pm 1.30 and 47.67 \pm 0.42 days, respective. While the number of fruits per plant (19.17 \pm 0.87 and 19.83 \pm 0.60 fruits/plant) and the total fruit weight per plant (146.48 \pm 8.92 and 147.56 \pm 4.98 g/plant) were received, which no statistically different between treatments. There were no significant differences in the fruit weight, fruit size, fruit colorimetric (CIE L*a*b), total soluble solid (TSS) and percentage of citric acid content among all treatments. Except for the white light with the light intensity of 21 $\mu\text{mol.m}^{-2}.\text{s}^{-1}$ had no yield.

Keywords: Cherry tomatoes, Growth, Light type, Yield quality

¹ Faculty of Science and Agricultural Technology, Rajamangala University of Technology Lanna Lampang Lampang 52000

² Department of Microbiology and Parasitology, Faculty of Medical Science, Nuresuan University, Phisanulok province 65000

³ Agricultural Technology Research Institute, Rajamangala University of Technology Lanna, Lampang, Rajamangala University of Technology Lanna. Lampang, 52000

* Corresponding author email: mos445566mos@gmail.com

Evaluation of salinity-induced progressive leaf temperature changes in RD6 and salt-tolerant RD6 rice seedlings using a simple thermal imaging technique

Chonticha Phromduang^{1,*} and Watanachai Lontom¹

RD6 is one of the most popular glutinous rice cultivars grown in Thailand. However, this cultivar is sensitive to salt stress, which is usually occurring in the rice-growing areas located in the northeast. Thus, introgression of *Saltol* QTLs from Pokkali to RD6 rice generated salt-tolerant RD6 (RD6 improved line; RD6 IL). Evaluation of how salt stress affects rice can be done by detecting plant temperature using a simple and non-destructive approach called thermography. Therefore, the objective of this study was to investigate changes in rice leaf temperature due to salinity stress in RD6, RD6IL, Pokkali, and IR29 rice seedlings using a simple thermal imaging technique. The experiment was divided into 2 groups, including a control group and a salt-treated group, which were subjected to a series of 40, 80, and 120 mM NaCl. The experiment was laid out as a completely randomized design with 3 replications. Thermal images of seedlings were taken using the FLIR C2 thermal camera. The results revealed that the leaf temperature changes of RD6 and IR29 increased with increasing NaCl concentrations. A similar trend but with a lower degree of change was observed in RD6IL. In addition, leaf temperature data could be used to calculate the crop water stress index and index of stomatal conductance. However, these thermal indices were not significantly different between RD6 and RD6IL.

Keywords: Leaf temperature, Rice, Salt stress, Thermal image

¹ Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

* Corresponding author email: chonticha.p@kkumail.com

Evaluating physiological responses of newly improved RD6 rice with introgressed *Saltol* QTL to salinity stress

Supidcha Natee¹, Jirawat Sanitchon² and Maysaya Thitisaksakul^{1,3,*}

The objective of this study was to compare the yield and physiological response of the newly improved RD6 rice lines (Morkho 60-2 and BC₄F₄ 132-12-61) to the original RD6 and the salt-tolerant cultivar, Pokkali, under salinity stress (EC 10 dS/m) during the reproductive stage. The results showed that salt stress decreased the percentage of seed fertility of Morkho 60-2 genotype and the original RD6 genotype, while that of BC₄F₄ 132-12-61 and Pokkali genotypes was not affected by salt stress. Furthermore, the salt stress reduced the 100-grain weight of all rice genotypes. As for the physiological response, salt stress raised the ratio of sodium ions to potassium ions in root and flag leaves but decreased the photosynthetic pigment concentration of Morkho 60-2 and the original RD6 genotypes. However, BC₄F₄ 132-12-61 and Pokkali genotypes were unaffected by salt stress. Moreover, salt stress increased the electrolyte leakage (EL) of the RD6 genotype, while it had no effect on the Morkho 60-2, BC₄F₄ 132-12-61, and Pokkali genotypes. Salt stress, on the other hand, had no effect on rice growth and development, as well as the relative water content (RWC) and malondialdehyde (MDA) content of all rice genotypes.

Keywords: Plant physiology, Rice, Salt stress, Yield

¹ Department of Biochemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

² Department of Agronomy, Faculty of Agriculture, Khon Kaen University, Khon Kaen 40002, Thailand

³ Salt-tolerant Rice Research Group, Khon Kaen University, Khon Kaen 40002, Thailand

*Corresponding author email: mayath@kku.ac.th

Exogenous silicon alleviates some salt stress damage in KDML105 rice seedlings

Wongsakorn Wongla^{1,*} and Watanachai Lontom¹

Salt stress was mainly reported as a highly injurious issue that decreased rice yield in the northeastern part of Thailand. It dramatically reduces water absorption, damages photosynthesis, and induces oxidative stress in plants. Silicon (Si) is a beneficial element, widely used for promoting plant growth and recovering from severe stress damage. Hence, this research aimed to investigate whether Si application can enhance the growth and physiology of the KDML105 rice seedlings under salt stress. The hydroponically grown seedlings of KDML 105 rice were subjected to salinity conditions by adding 120 mM sodium chloride to the nutrient solution. Besides, control and salinity conditions were also applied to 2.0 mM sodium silicate. The results showed that salt stress significantly reduced seedling growth, relative water content (RWC), and leaf gas exchange. Si addition significantly improved salinity-affected dry mass. The RWC and net photosynthetic rate of KDML105 rice seedlings were significantly increased under Si-treated salinity conditions. In addition, the PCA-biplot showed that Si-treated seedlings were separated from non-treated seedlings under salt-stressed conditions. According to this finding, Si may be able to alleviate some salt stress damage in KDML105 rice seedlings.

Keywords: KDML105, Salt stress, Silicon, Sodium chloride

¹ Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

* Corresponding author email: w_wongsakorn@kkumail.com

A study on the effect of daily light integral on growth of Asiatic pennywort (*Centella asiatica* L.) grown in closed system

Pimmada Pattrapadit^{1,*} and Phasini Sakulmaeka¹

In a study on the effect of daily light integral (DLI) on growth of Asiatic pennywort in a closed plant production system (CPPS). The cultivation of Gotu Kola in hydroponics system with three DLI values of 8.84 mol m⁻² d⁻¹ (DLI1), 7.07 mol m⁻² d⁻¹ (DLI2) and 5.30 mol m⁻² d⁻¹ (DLI3) which were calculated using photoperiods of 15, 12 and 9 hours, respectively. The plant was operated in the closed plant production system (CPPS) using nutrient film technique (NFT).

According to statistical analysis, the results of fresh mass from planting with three different DLIs showed no statistically significant difference while dry mass delivered a statistically significant difference. Additionally, the largest dry mass of stem (39.17 g) and root (7.29 g) was provided by Gotu Kola grown with DLI2 (7.07 mol m⁻² d⁻¹). From essential substances analysis, there was no significant difference in the quantity of Madecassic Acid (MA) in Gotu Kola with the three DLIs. While planting with DLI1 (8.84 mol m⁻² d⁻¹) providing the highest amount of Asiatic acid (0.23 %W/W) but there was no significant difference in the quantity with DLI2.

Furthermore, development of a mathematical model from the relationship of essential substances and plant growth could generate the empirical correlation in form of second order and first order polynomial function.

Keywords: Asiatic pennywort, Closed plant production systems (CPPS), Daily light integral (DLI), Hydroponics system

¹ Naresuan University Secondary Demonstration School

* Corresponding author email: pimmadap64@nu.ac.th

The production of flathead lobster (*Thenus orientalis* (Lund, 1793)) in close system with smart farm

Krit Chaiwong^{1,*}, Chutiwat Phuengpakdee¹, Thanaphat Phra-Thaen¹,
Kritsana Krajabthong² and Rungkan Klahan^{2,*}

A study on flathead lobster production under a closed system with a smart farm was studied. The objective was to study the feasibility and compare the productivity cost of flathead lobster farming under a smart farming system. The experiments were conducted on raising flathead lobster and divided into two groups a traditional and smart farming system. The trial used flathead lobsters caught from fishermen with crab nets in Phetchaburi province, where lobsters weigh 50-70 grams per the fed with one fresh green mussel per individual once a day. The experiment was conducted for 60 days. At the end of the experiment, it was found that the growth performance and feed utilization of flathead lobster in both systems were not significantly different ($P>0.05$). However, when considering the B/C ratio, it was found that flathead lobster in a smart farm system provided a better B/C ratio ($P<0.05$). However, the electric fee and system cost have to consider because they affect higher production costs in the smart farm. Therefore, this experiment indicated that flathead lobster could be raised with a smart farm system but had to consider the cost of the system and electricity, including the number of rearing for cost-effectiveness.

Keywords: Close system, Flathead lobster, Smart farm

¹ Division of Information and Communication Engineering Faculty of Engineering and Industrial Technology Phetchaburi Rajabhat University

² Division of Aquaculture Faculty of Agricultural Technology Phetchaburi Rajabhat University

* Corresponding author email: supremrukiirun@gmail.com

**Effect of supplementation of *Centella asiatica* crude extract
in giant freshwater prawn diets on growth performance, immune system
and gut microbiome**

Donlaya Pinmuang¹, Phanupong Changtor¹ and Nonglak Yimtragool^{1,2,*}

Macrobrachium rosenbergii, the giant freshwater prawn, has become an important economic aquatic animal in Thailand. However, the problems in cultivating industry include infectious diseases caused by many pathogens. Presently, disease prevention using antibiotics in prawns causes concerns to consumers on residues. This study aimed to apply a medicinal plant to reduce antibiotic use by enhancing prawn health. Commercial feed containing 1, 5, and 10 g/kg of a crude powder extract of *Centella asiatica* was fed to prawns for 28 days. Hemolymph and intestine were collected for immune assay and metagenomic analysis, respectively. The results indicated that the growth performance, survival rate, and total protein assay were statistically nonsignificant across all experiments. On the other hand, prawn feeding by 5 and 10 g/kg had remarkable differences in lysozyme assay and phenoloxidase activity. Furthermore, the crude extract obtained from *C. asiatica* at a concentration of 10 g/kg can assist in the increase of beneficial bacteria such as *Lactococcus* sp. and decrease disease-causing bacteria such as *Candidatus hepatoplasma* and *Thiothrix* spp.

Keywords: *Centella asiatica*, Immunoassay, *Macrobrachium rosenbergii*, Metagenomic

¹ Department of Biology, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Center of Excellence for Biodiversity, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: nonglakp@nu.ac.th

Effect of thermal stress on physiological response of barnacles in Si Chang Island, Chonburi Province

Kamolluk Deeudom^{1,*}, Benny K.K. Chan² and Monthon Ganmanee¹

Distribution and abundance of marine organisms are determined by environmental temperature which increase every year due to global climate change, Especially intertidal organisms as they are subject to periodic tidal emersion and experienced intense thermal stress during daytime low tides. Barnacles are major space occupiers on rocky intertidal zone as sessile species. These features make them are good models to study effects of thermal stress for predicting distribution pattern of Indo-Pacific marine organisms. In this study, investigate of their physical response to heat and desiccation stress, Temperature on study site were recorded with biomimetic logger on study site and their response to thermal challenge were studied under laboratory condition. The experiment were set up to compare between the two common intertidal barnacles in Koh Si Chang, Chonburi Province: There *Chthalamus* sp., the species which found on high mid-tidal zone and *Tetraclita* sp., the species which found on low mid-tidal zone. On-shore measurement of habitat temperature revealed that the temperature of the exposed area was higher than the shaded area (55.75 C and 54.50C respectively). When *Chthalamus* sp. and *Tetraclita* sp. were exposed to rock temperatures of 45 C for 3 h, all individuals (100%) of *Chthalamus* sp. entered a coma state, at an earlier time than *Tetraclita* sp. (77.5%). *Chthalamus* sp. had a survival rate greater than *Tetraclita* sp. when re-immersed into water within 24 h. The result suggested that species from high mid-tidal zone can adaptively response to cope with thermal stress better than species located at low mid-tidal zone. In addition, the data recorded in the hottest months of the year (February-May) showed that barnacles were subjected to heat stress that exceeded their temperature tolerance.

Keywords: Barnacles, Biomimetic logger, Global climate change, Heat stress, Rocky shore, Zonation

¹ Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

² Biodiversity Research Center, Academia Sinica, Taipei 11529, Taiwan

* Corresponding author email: Kamolluk.deeudom@gmail.com

Chronic exposure of simvastatin disrupts histology and protein profile of the hooded oyster (*Saccostrea cucullata*)

Jiraporn Tasonthia¹, Dumrongsak Pekthong² and Sutin Kingtong^{1,*}

Simvastatin is among the most prescribed pharmaceuticals for cardiovascular disease. The contamination of simvastatin in the ecosystem has been reported. However, the impact on aquatic animals is unknown. Therefore, this study investigated the chronic effects of simvastatin in the hooded oyster (*Saccostrea cucullata*) which is an economically important animal in Thailand. The exposure experiment was performed in laboratory condition by using the concentrations relevant to environmental levels which included 0, 200, 1,000, 5,000, and 10,000 ng/L. Tissue effect and protein profile were observed by using histological technique and SDS-PAGE, respectively. Histological results showed that simvastatin affected on stomach tissue by increasing the number of mucocyte and affected the digestive glands by increasing of vacuole amount and decreasing of cell height of digestive cells. SDS-PAGE results showed that simvastatin up-regulated protein band at 24.7 kDa and 22.3 kDa at concentrations of 1,000, 5,000 and 10,000 ng/L. This work demonstrates the effects of long-term environmentally relevant concentrations of simvastatin on aquatic organisms and will be useful for the development of a proper guideline for managing simvastatin usage.

Keywords: Chronic effect, Hooded oyster, Protein, Simvastatin

¹ Department of Biology, Faculty of Science, Burapha University, Chonburi, 20131

² Department of Pharmacy Practice, Faculty of Pharmacy, Naresuan University, Phitsanulok, 65000

* Corresponding author email: sutin@go.buu.ac.th

Effect of yeast autolysate on the productivity and immune status in lactating sows

Phatchara Chaisena¹, Choawit Rakangtong¹, Chaiyapoom Bunchasak¹ and Wiriya Loongyai^{1,*}

The aim of this study was to investigate the effects of yeast autolysate (YA) supplementation in sow diet during gestation period on the performance and immunity. The experiment started on first day of gestation and ended on lactation. In total 60 sows were allocated to two treatments: the CON (control group) and YA (yeast autolysate group: the sows were fed the control diets supplemented with 13.5 g/day on gestation period and 20 g/day until end of lactation). The results showed that the number of pigs born, born alive, mean body weight, mean litter weight, survival rate, litter size, litter weight at weaning, average pig weight at weaning and average daily gain for piglet showed no significantly. In addition, YA supplementation on the immunity, the result showed that plasma concentrations of immunoglobulin M, immunoglobulin A, blood urea nitrogen, total protein and creatinine were no significantly but higher plasma concentration of immunoglobulin G (IgG) compared with sows fed CON diet group at day 7 of lactation ($p < 0.05$). In conclusion, YA supplementation in maternal diets improved the health status of sows and improved the immunity of sows during late pregnancy.

Keywords: Productivity, Sows, Yeast autolysate

¹ Department of Animal sciences, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand

* Corresponding author email: agrwyl@ku.ac.th

Effects of crude palm oil supplementation on egg production performance, eggs quality, and blood serum lipid profile in laying hen

Apisit Ongsara¹, Khaem Longnapa² and Arraya Jeanmas^{2,*}

The objective of this study was to determine the effects of crude palm oil supplementation on egg production performance, egg quality, and the blood serum lipid profile of laying hens. In experiment 1, 120 female Hy-Line Brow laying hens, 28 weeks old, were divided into 2 groups of 5 repetitions of 12 birds each. They were administered an experimental diet consisting of the control diet and 4% crude palm oil. In experiment 2, 120 female Hy-Line Brow laying hens, 40 weeks old, were divided into 2 groups of 5 repetitions of 12 birds each. They were administered an experimental diet consisting of the control diet and 6% crude palm oil. Data were collected on egg production, egg quality, and the blood serum lipid profile at 8 weeks. The data were analyzed by an independent sample t-test method. The results showed that crude palm oil supplementation at 4 and 6 percent had no effect on feed intake and average egg weight. Hen day production and egg mass decreased while the feed conversion ratio per kilogram of egg increased when supplemental crude palm oil increased ($p < 0.05$). Supplementation of 6% crude palm oil significantly increased the yolk color. Supplementation of crude palm oil had no significantly different effect on the blood serum lipid profile.

Keywords: Blood serum lipid profile, Crude palm oil, Egg performance, Eggs quality, Laying hen

¹ Master's degree student, Agricultural and Fishery Science, Faculty of Science and Technology, Prince of Songkla University, Pattani, Thailand, 94000

² Agricultural and Fishery Science, Faculty of Science and Technology, Prince of Songkla University, Pattani, Thailand, 94000

* Corresponding author email: araya.j@psu.ac.th

The effect of the emulsifier supplementation in diets on performance, carcass quality, and apparent metabolizable energy (AME) of broiler chickens

Kasama Sudtilak^{1,*}, Chaiyapoom Bunchasak¹, Phongthorn Kongmun¹, K.Teepalak Rangubhet¹,
Sombat Prasongsuk¹ and Theerawit Poeikhampha¹

This study was conducted to evaluate the effect of the emulsifier supplementation in diets on performance, carcass quality, and apparent metabolizable energy (AME) of broiler chickens. 875 Male day-old broilers were raised in a close system house and divided them into 5 groups with 5 replications (35 birds per replication). The experimental feed was done according to the nutrients recommendation of strain and assigned according to Completely Randomized Design to receive 5 diets, including: 1) Control (basal diet), 2) Control + 0.050% emulsifiers, 3) Basal diet - 50 kcal/kg (negative control; NC), 4) NC + 0.025% emulsifiers and 5) NC + 0.050% emulsifiers. The results indicated that the NC diet supplement with 0.025% and 0.050% emulsifier improved growth performance and carcass quality similar to those fed the basal diet. However, no difference was found in the apparent metabolizable energy with difference emulsifier supplementation groups. It could be concluded that the 0.025% emulsifier supplementation in a low-energy diet gave the growth performance and carcass quality similar to the basal diet.

Keywords: Available metabolizable energy, Broiler, Carcass quality, Emulsifier, Performance

¹ Department of Animal Science, Faculty of Agricultural, Kasetsart University, Bangkok, Thailand, 10900

* Corresponding author email: agrtrw@ku.ac.th

Effects of organic mineral supplementation in diet on growth performance and production cost in broiler chickens

Pantaree Visessing¹, Chaiyapoom Bunchasak and Choawit Rakangthong^{1,*}

This study investigated the effects of inorganic and organic micromineral supplementation in broiler diets on growth performance, wooden breast, white striping, and foot pad dermatitis. A total of 300 one-day-old male Ross308 broilers were used, divided into two experimental groups, 10 replicates, with 15 chicks each. The total period of the experiment was 35 days. The results showed that broilers fed with inorganic and organic mineral supplements had no significant difference in body weight, weight gain and feed conversion ratio over the experimental period from 1 to 35 days of age ($P > 0.05$). Similarly, there was no difference in the effect of food cost per weight gain on both forms of micromineral supplementation ($P > 0.05$). In addition, different mineral supplementation did not affect the incidence of wooden breast, white striping, and foot pad dermatitis. This study shows that using organic minerals in broiler feed is one approach that can reduce feed mineral consumption without affected on growth and feed costs in broiler production.

Keywords: Broiler chickens, Growth performance, Organic minerals

¹ Department of Animal Science, Faculty of Agriculture, Kasetsart University, Bangkok 10900

* Corresponding author email: fagrcwr@ku.ac.th

Effect of dietary supplementation of Habanero pepper powder on meat quality and growth performance of broiler chickens

Thanathip Supcharoenkul¹, Nattharin Phisitaukara¹, Choawit Rakangtong¹,
Chaiyapoom Bunchasak¹, Komwit Surachat^{2,3} and Wiriya Loongyai^{1,*}

This research used Habanero pepper powder (HPP) as a dietary supplement to solve the problem of undesirable meat characteristics and enhance the growth performance of broilers. Nowadays, broiler breeds have been improved to produce more products in a shorter time. Whereas the increase in abnormal muscle development such as Wooden breast (WB) and White striping (WS), affects consumers purchasing intention. In this experiment, a total of 24 one-day-old male Ross308 broiler chickens were randomly assigned to two treatments: the control group (CON) and Habanero pepper treatment group (0.02% HPP). After 42 days of the experiment, the weight gain, feed intake, and mortality rate data were recorded in all phases. The results showed that the body weight gain of the HPP group was significantly higher than that of the CON group ($p \leq 0.01$) in the grower phase. In addition, the Feed conversion ratio (FCR) and feed cost per gain (FCG) of the HPP group were significantly reduced when compared to the CON group ($p \leq 0.01$). The CON group showed a mortality of 16.67%. The result of muscle characteristics WB and WS of broilers showed no significant difference between groups. The results of the present study demonstrated an increase in the growth performance of chickens fed 0.02% Habanero pepper powder.

Keywords: Broilers, Feed additives, Growth performance, Habanero pepper

¹ Department of Animal Science, Faculty of Agriculture at Kasetsart University, Bangkok 10900, Thailand

² Department of Biomedical Sciences and Biomedical Engineering, Faculty of Medicine, Prince of Songkla University, Songkhla 90110, Thailand

³ Translational Medicine Research Center, Faculty of Medicine, Prince of Songkla University, Songkhla 90110, Thailand.

* Corresponding author email: agrwyl@ku.ac.th

Comparison of *Acetobacter xylinum* culture medium from fruit juice in bioplastic production

Korapat Phukitirat¹, Jirapatch Choksirison¹, Non Pranuch¹ and Piyanoote Jaihan^{2,*}

Plastic from petroleum is one of the significant environmental pollution problems because takes a long time to decompose. Today, more people are switching to bioplastics made from bacterial cellulose, such as *Acetobacter xylinum* and *Achromobacter* S3 which are easier to decompose. Therefore, this project aimed to compare the amount of bacterial celluloses obtained from *A. xylinum* culturing in various juice agar mediums. To study the best bioplastics made from bacterial cellulose. *A. xylinum* was cultured in fruit juice agar; coconut juice, watermelon juice, pineapple juice, and sugarcane juice, for 7 and 14 days to measure the size and weight of bacterial cellulose. The morphology was studied by using Scanning Electron Microscope (SEM). Then added glycerol in the bacterial cellulose at 0, 0.5, 1, 1.5, and 2 % V/V concentrations. The result showed that *A. xylinum* culturing in pineapple juice agar medium at 14 days produced the most weight and thickness of bacterial cellulose which weight 30.36 ± 1.07 grams and had thickness at 0.53 ± 0.02 centimeters and had the most orderly intertwining of fibers. The appropriate concentrations of glycerol for bioplastic fabrication are 1 and 1.5% V/V. Therefore, it can be concluded that *A. xylinum* can produce bacterial cellulose. Moreover, it can be used to produce bioplastics to reduce the plastic problem.

Keywords: *Acetobacter xylinum*, Bacterial cellulose, Bioplastic

¹ Piboonbumpen Demonstration School, Burapha University

² Science Classrooms in University-Affiliated School Project, Science Burapha University

* Corresponding author email: Piyanoote.ja@buu.ac.th

Effects of stress factors on cell survival and antioxidant production by thermotolerant yeast

Suttaon Trongtokit¹, Keeratiyada Sanyos¹ and Pongsanat Pongcharoen^{2,*}

Yeasts are widely used in various processes, especially in ethanol production. Ethanol can be produced from agricultural waste materials containing lignocellulose. However, glucose is obtained by distilling lignocellulosic biomass through pretreatment and hydrolysis. These processes produced the byproduct of distillation, which is a furfural compound. Furfural is highly inhibitory to the fermentation and can substantially reduce the efficiency of ethanol production. The purpose of study was to determine the cell growth performance and cell viability of yeast strains that tolerate the stress of furfural concentration for further application in ethanol processing. Here, yeasts strains including eight isolates of *Candida tropicalis* Ti-P1, Ti-P2, Ti-P3, Ti-P4, Ti-P5, Ti-P6, Ti-P7, and Ti-P8, and two reference yeast strains including, *Saccharomyces cerevisiae* TISTR5606 and *Pichia kudriavzevii* TISTR5147, were determined the growth ability under furfural stress. The results demonstrated that one isolate of *C. tropicalis* Ti-P8 grew at furfural concentrations of 20 and 25 mM, whereas other isolates of *C. tropicalis* and reference strains did not grow at that concentration. The result from cell viability assay confirmed that the number of yeast *C. tropicalis* Ti-P8 did not decrease when the concentration of furfural increasing. It is possible that *C. tropicalis* Ti-P8 produced antioxidants to protect toxic from furfural better than other yeast strains. Therefore, *C. tropicalis* Ti-P8 might be further applied in ethanol production. To gain further insight to improving ethanol yields, further research should be required.

Keywords: Antioxidant, *Candida tropicalis*, Ethanol, Furfural, Stress

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

² Faculty of Agriculture, Natural Resources and Environment, Naresuan University, Phitsanulok, 65000

* Corresponding author email: pongsanatp@nu.ac.th

Comparison of optimal conditions for decomposition of polystyrene foam with *Pseudomonas* sp.

Pimchanok Wongnakharin^{1,*}, Supatsorn Mungmai¹ and Thapanee Sitalapruerk¹

Foam is a material synthesized from polystyrene (PS) and widely used in daily life. For this reason, the amount of foam waste is increasing every year. Normally, the elimination of foam can be done with many methods, including burning, using chemical or burial. Since, naturally foam degradation will spend many years. In addition, foam elimination with normal method often causes environmental pollution. From the previous research, it was found that *Pseudomonas* sp. can degrade some plastic that synthesized from polystyrene. Therefore *Pseudomonas* sp. TISTR554 obtained from Thailand Institute of Scientific and Technological Research was used in this study. The aims of this study is to find the appropriate conditions for degrading polystyrene by *Pseudomonas* sp. TISTR554 with controlling different temperatures including, 25°C, 30°C, 37°C and room temperature (35-38°C). The foam was pretreatment by using UV for 24 hours, after that 1%, bacteria were inoculated into nutrient broth with foam. Meanwhile, changes in mass of foam were recorded every 7 days for 4 weeks. The result shows that all foam weight does not decrease when the time is up. So, it couldn't be concluded that *Pseudomonas* sp. TISTR554 can actually decompose the foam due to some factors such as biofilm, culture media and heat or time that isn't enough. In the future, if there were more time, there would be better in controlling and planning the experiment. Moreover, there will be leading to development for reducing time in degrading foam, and there will be absolutely no toxic residue that will negatively affect the environment.

Keywords: Biodegradable, Polystyrene foam, *Pseudomonas* sp.

¹ Darunsikkhalai school, King Mongkut's University of Technology Thonburi, Tha Kham, Bang Khun Thian, Bangkok, 10150

* Corresponding author email: pimchanok.2549belle@gmail.com

Effects of using spent mushroom substrate ensiled with whole-crop corn on rumen digestibility by *in vitro* technique

Nattanitcha Ngaowkakhiaw¹, Phongthorn Kongmun¹ and K.Teepalak Rangubhet^{1,*}

The objective of this research was to study the effect of using spent mushroom substrate (SMS) ensiled with whole-crop corn on nutrient compositions, rumen digestibility, rumen-fermentation parameter, and enteric methane production by *in vitro* technique. Three dietary treatments with five replications were assigned in CRD, which included 1) 100% corn silage (control), 2) corn ensiled with SMS of *Pleurotus djamor* (SMSPD), and 3) corn ensiled with SMS of *Lentinus polychrous Lév* (SMSLP). The results showed that the crude protein content of whole-crop corn ensiled with spent mushroom substrate was significantly decreased ($P<0.05$), while the total tannin content was significantly increased ($P<0.05$). The digestibility of cell wall contents and lignin in whole-crop corn ensiled with spent mushroom substrate was significantly higher than in the control group ($P<0.05$). Therefore, it can be concluded that the use of mushroom cultivation residues which contain tannins, can improve the rumen digestibility and effectively reduce the production of methane in the ruminant.

Keywords: *In vitro* technique, Methane, Rumen digestibility, Spent mushroom substrate, Tannin

¹Department of Animal Science, Faculty of Agricultural, Kasetsart University, Bangkok, Thailand, 10900

*Corresponding author email: fagrklr@ku.ac.th

Nutritional value and digestibility evaluation of Napier grass ensiled with spent mushroom substrate by *in vitro* technique

Pacharapon Inaoy¹, Phongthorn Kongmun¹ and K. Teepalak Rangubhet^{1,*}

Napier grass, an important source of roughage for ruminants, is used with agriculture by-products, which can help to decrease the feed cost and promote rumen digestibility. The objective of this research was to evaluate the nutritional value and digestibility of Napier grass ensiling with spent mushroom substrate for 21 days of fermentation. A complete randomized design was used by assigning Napier grass silage as a control group (C) and the other 4 treatments included Napier grass ensiled with spent mushroom substrate of *P. ostreatus* (PO), *P. djamor* (PD), *L. squarrosulus* (LS) and *L. polychrous* (LP) in a ratio of 1 to 1 on dry matter basis. The result showed that crude protein and ether extract of Napier ensiled with spent mushroom substrate were significantly decreased ($P<0.01$), while the amount of phenol and tannin were significantly increased ($P<0.05$). In addition, the digestibility of fibers in the cell wall was increased ($P<0.01$), while methane production significantly decreased ($P<0.05$). Therefore, the ensiling of Napier grass with spent mushroom substrate can increase the digestibility of plant cell wall fibers and reduce the production of methane gas.

Keywords: *In vitro* technique, Rumen digestibility, Methane, Spent mushroom substrate, Napier grass silage

¹ Department of Animal Science, Faculty of Agriculture, Kasetsart University, Bangkok, Thailand, 10900

* Corresponding author email: fagrklr@ku.ac.th

Effects of rice straw quality improvement by legumes on rumen fermentation and methane emission by *in vitro* technique using the DAISY^{II} incubator

Nongnapas Puttasaraphan¹, Phongthorn Kongmun¹ and K.Teepalak Rangubhet^{1,*}

The aim of this research was to study the effect of rice straw quality improvement by legumes on rumen fermentation and methane emission by *in vitro* technique using the DAISY^{II} incubator. Eight dietary treatments with five replications were assigned into 2×4 Factorial in CRD. There are two factors including legume types (Leucaena and Alfalfa) and rice straw-to-legume ratios (0:100, 25:75, 50:50 and 75:25), with the 100% rice straw as a control group. The results revealed that dry matter content was significantly different in all experimental groups ($P<0.05$). The crude protein and tannin content of Leucaena showed the highest value ($P<0.05$). In addition, nutrient digestibility was improved when legumes were used up to 75% in combination with rice straw ($P<0.05$). Leucaena gave the least amount of methane production ($P<0.05$), which tannins can effectively reduce methane production in the rumen. Therefore, the use of Leucaena or alfalfa in an appropriate ratio with other roughage such as rice straw can improve the quality of roughage in ruminants.

Keywords: Legumes, Methane, Rumen fermentation

¹ Department of Animal Science, Faculty of Agricultural, Kasetsart University, Bangkok, Thailand, 10900

* Corresponding author email: fagrklr@ku.ac.th

Synthesis of silver nanowires using hydrothermal method and their antimicrobial applications

Jaruwan Thepsiri¹, Sasiporn Audtarat¹ and Thananchai Dasri^{1,*}

Silver nanowires (AgNWs) are considered the most promising antimicrobial agents due to their excellent antimicrobial activity. In this work, AgNWs were synthesized by using a hydrothermal method with glucose as a reducing agent. The reaction was carried out at a reaction temperature of 160 °C over a reaction time of 22 hrs. The prepared AgNWs were characterized by UV–vis spectroscopy (UV-vis), field emission scanning electron microscopy (FE-SEM) and X-ray diffraction (XRD). Bactericidal tests of AgNWs against two pathogens, including Gram-positive *Staphylococcus aureus* and Gram-negative *Escherichia coli*, showed a significant reduction in growth results compared to a standard antibiotic, streptomycin. These results suggest that the synthesized AgNWs could be promising as a kind of antibacterial material for their potential applications in a wide range of medical and environmental fields.

Keywords: Antimicrobial properties, Hydrothermal synthesis, Silver nanowires

¹ Faculty of Interdisciplinary Studies, Khon Kaen University, Nong Khai Campus, Nong Khai, 43000, Thailand

* Corresponding author email: thananchai@kku.ac.th (T. Dasri)

Remineralizing effects of Nano-silver fluoride on artificial dentine caries in a biofilm-challenged environment (Pilot study: *In-Vitro* study)

Peeraya Punpeng¹, Panida Thanyasrisung², Prompong pienpinijtham³
and Nattanan Govitvattana^{1,*}

The aim of this study was to investigate the remineralization efficiency of Nano-silver fluoride on artificial dentine caries in a biofilm-challenged environment. Twelve permanent molar teeth were prepared by cutting into dentine slices (3x3x2 mm³). After artificial caries were created, all specimens were randomly assigned into 3 groups: Group 1 Nano-silver fluoride 400 ppm (NSF400), Group 2 5% Sodium fluoride varnish (NaF) and Group 3 Deionized water (Control). All specimens were immersed in culture media containing *S. mutans* and *C. albicans* for 24 hours to create biofilm. Then, these underwent to a dual-species microbial pH-cycling for 7 days. Surface microhardness was determined using a Knoop microhardness tester. Data were analyzed using Paired t-test and One-way ANOVA with Tukey's post hoc test ($p < 0.05$). The result demonstrated that, the mean %SHR of group 1, group 2 and group 3 were 18.464 ± 3.274 , 1.402 ± 1.165 and -1.008 ± 0.549 respectively. The mean %SHR in group 1 was significantly higher when compared with group 2 and group 3. In conclusion, Nano-silver fluoride provided remineralization effects on artificial dentine caries better than 5% Sodium fluoride varnish statistically significant.

Keywords: Dental Caries, Dentine, Fluoride, Nano silver, Remineralization

¹ Department of Pediatric Dentistry, Faculty of Dentistry, Chulalongkorn University

² Department of Microbiology and Center of Excellence on Oral Microbiology and Immunology, Faculty of Dentistry, Chulalongkorn University,

³ Department of Chemical, Faculty of Science, Chulalongkorn University

* Corresponding author email: nattanang@gmail.com

Antibacterial activity of giant African snails' mucus against *Staphylococcus aureus* and *Staphylococcus epidermidis*

Natsiri Prommanon¹, Panuwit Nein¹, Nannapat Tajak¹ and Wipasiri Soonthornchai^{1,2,*}

Snails are usually classified as pests for many plant species; however, their mucus, composed of bioactive compounds, is useful in the cosmetic industry and medicine for its antimicrobial activity. Therefore, we aimed to investigate the antibacterial peptide properties of the mucus isolated from three land snails, including *Achatina fulica* (black), *Achatina fulica* (albino), and *Sarika siamensis*. Crudely purified mucus was collected from three land snails and analyzed using SDS-PAGE. Additionally, the antibacterial peptide activity was evaluated using the agar well diffusion method against *Staphylococcus aureus* and *Staphylococcus epidermidis*. The profiles of mucus proteins from three snails showed a different pattern between two types, while the profiles of black and albino snails were slightly different. Moreover, the diameter of growth inhibition zones was measured. The result demonstrated that the mucus of *A. fulica* black and *A. fulica* albino snails inhibited the growth of *S. aureus* (11.59 ± 0.17 , 12.26 ± 0.15 mm, respectively) and *S. epidermidis* (12.34 ± 0.65 , 13.31 ± 0.44 , respectively), whereas the *S. siamensis* mucus was unable to resist the growth of both bacteria. Taken together, these findings suggest that the snail mucus isolated from both *A. fulica* snails might be potentially developed for a new therapeutic agent to treat skin diseases.

Keywords: *Achatina fulica*, Mucus, *Sarika siamensis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*

¹ Demonstration School, University of Phayao, Phayao, 56000

² Program in Biology, School of Science, University of Phayao, Phayao, 56000

*Corresponding author email: wipasiri.so@up.ac.th

Antibacterial activity of mucus isolated from different sizes of the Giant African snail (*Lissachatina fulica*)

Peerada Yookon¹, Montida Chuekham¹, Rungnapha Yodkaew¹ and Wipasiri Soonthornchai^{1,2,*}

The giant African snail's (*Lissachatina fulica*) mucus is the first line of defense against pathogenic microorganisms. Although several reports have demonstrated the antibacterial activities of its mucus inhibiting both Gram-positive and -negative bacteria, it lacks information about the bacterial activity of each size of the snail's mucus. Therefore, this study aimed to evaluate the antibacterial property of snail mucus against the growth of *Staphylococcus aureus* and *Staphylococcus epidermidis*. We collected and categorized the snail into four categories based on its sizes including giant (G; 93.75g), big (B; 43.61±2.61g), medium (M; 23.37±3.35g), and small (S; 10.43±2.27g). Mucus was separately isolated, and the mucus was measured by weight. Then, all mucus of each size were pooled and filtrated through a 0.45-µM membrane to evaluate the antibacterial activity using the well diffusion method. Our results demonstrated that the weights of mucus for B, M and S sizes were 2.67±1.15, 1.67±1.13 and 0.58±0.26g, respectively. The Pearson correlation exhibited a positive correlation between mucus weight and snail sizes (B and M) with $r = 0.68$ and 0.66 , respectively, while it showed a negative correlation for the S size with $r = -0.26$. Our finding also revealed that G, B, M, and S sizes of snails had significant antibacterial activities against *S. aureus* (11.39±0.17, 11.47±0.15, 9.55±0.26 and 10.96±0.51 mm, respectively) and *S. epidermidis* (11.88±0.34, 11.13±0.16, 10.12±0.28 and 11.73±0.35 mm, respectively). Collectively, our finding suggests that all sizes of *L. fulica* could be used for further studying the antibacterial peptide of snail mucus.

Keywords: Antibacterial peptide, Bacteria, Giant African snail, Snail mucus, Snail size

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

² School of Science, University of Phayao, Phayao 56000, Thailand

* Corresponding author email: wipasiri.so@up.ac.th

Physicochemical properties of protein isolate from soy sauce residue and antioxidant potential of pineapple peel extract

Long Chhovin¹, Supaporn Passorn¹, Khanchai Danmek¹ and Rawisara Ruenwai^{1,*}

Agro-industrial wastes are of great interest because they are significant natural sources of bioactive chemicals and can produce byproducts with added value. In this work, protein isolate was extracted from soy sauce residue using an acid-alkali method and polyphenol extract was obtained from pineapple peels by ethanolic extraction. The results showed that protein isolate from soy sauce residue (sSPI) had the total phenolic and flavonoid contents of 15.27 ± 0.47 and 12.78 ± 1.66 mg/g extract whereas the lower amount was detected in the soy protein isolate commercial grade (cSPI) only at 4.23 ± 0.11 and 1.16 ± 0.38 mg/g extract, respectively. In agreement with the DPPH radical scavenging activity (RSA) with the value of $22.39 \pm 0.89\%$ and $9.10 \pm 0.10\%$ of sSPI and cSPI, respectively. Emulsifying Ability Index (EAI) and Emulsifying Stability Index (ESI) of cSPI were higher than those detected in sSPI. By contrast, the protein solubility, and foaming properties of sSPI were significantly higher than cSPI. The total phenolic and flavonoid contents of pineapple peel were 9.80 ± 0.11 and 3.81 ± 0.16 mg/g extract, in which the value of RSA was found at $60.55 \pm 0.60\%$ respectively. The overall finding indicate that these agro-industrial wastes can be utilized as functional ingredients and that further research into the conjugation of soy protein isolate and polyphenol will be crucial to ensure a positive impact on the development of functional foods and nutraceutical products.

Keywords: Antioxidant activity, Physicochemical properties, Pineapple peel, Soy protein isolate, Soy sauce residue

¹ Division of Biotechnology, School of Agriculture and Natural Resources, University of Phayao 56000

* Corresponding author email: rawisara.rue@hotmail.com

Antioxidant activities and polyphenol contents of *Bidens pilosa* L. leaf extracts

Kantida Chaiyo¹, Komsak Pintha^{2,*}, Payungsak Tantipaiboonwong^{2,*},
Warunya Phukkhom¹ and Wipasiri Soonthornchai^{1,3}

In this study, polyphenol contents and antioxidant activity of *B. pilosa* leaf extracts were investigated. 20 g of *B. pilosa* leaves were extracted by 200 ml of 70% ethanol (BE), water (BW), and 90 degrees celsius hot water at different time intervals: 5, 10, 15, and 20 minutes (BHW5, BHW10, BHW15, BHW20). Total phenolic content (TPC) was analyzed by Folin-Ciocalteu reagent assay, while total flavonoid content (TFC) was determined by aluminum chloride colorimetric assay. The obtained results of TPC ranged from 190.53 ± 5.50 mg GAE/g extract to 215.79 ± 6.27 mg GAE/g extract (BHW10<BE<BHW20<BHW15<BHW5). For TFC, the results ranged from 173.39 ± 8.86 mg CAE/g extract to 191.74 ± 2.80 mg CAE/g extract (BHW10<BE<BHW15<BHW20<BHW5). However, *B. pilosa* leaves extracted by water presented the lowest in both TPC and TFC (31.15 ± 0.62 mg GAE/g extract and 10.05 ± 2.27 mg CAE/g extract, respectively). The antioxidant activity of all extracts was determined by ABTS assay. The *B. pilosa* leaves extracted by 15-minute hot water showed the highest antioxidant activity (IC₅₀=12.58 ± 0.33 µg/mL). In general, both ethanol and 90 degrees celsius hot water extract had similar maximum values of TPC and TFC; however, 15 minutes of hot water extract showed the highest antioxidant activity compared to other extracts.

Keywords: Antioxidant, *Bidens pilosa*, Flavonoid, Free radical, Phenolic

¹ Demonstration School University of Phayao, Phayao 56000

² School of Medical Science, University of Phayao, Phayao 56000

³ School of Science, University of Phayao, Phayao 56000

* Corresponding author email: komsakjo@gmail.com, payungsak.t@gmail.com

Development of drinking Japanese sweet corn supplemented with inulin to add value of low-grade corn

Chanapat Maneeted¹, Theeraphol Senphan², Natthaphong Mungmuang²
and Ratchanee Puttha^{1,*}

The low-grade corn affected on the decreasing in farmers' incomes and increasing in agricultural waste. The objective of this study was to develop a formula, study on the quality and evaluate the consumer acceptance of ready-to-drink of low-graded Japanese sweet corn milk fortified with inulin products which were evaluated using a Completely Randomized Design (CRD) with three replicates. The Japanese sweet corn milk fortified with inulin products 100 milliliters varied by sweet corn drink extracts with different volumes of 60, 55, 50 and 45 percentages (volume/weight) as formular 1, formular 2, formular 3 and formular 4, respectively. Analysis of qualitative traits and sensory evaluations by 60 untrained panelists were studied. The quality for all formulars of Japanese sweet corn milk fortified with inulin products were significance different ($p \leq 0.01$). The sensory acceptance for appearance, color, flavor, test (sweet) and overall were not significance different ($p \geq 0.05$) but total score was significance different ($p \leq 0.05$). Japanese sweet corn milk fortified with inulin products in formular 2 was chosen because it shown the highest total acceptant score of 35.08 from 50. It had lightness values (L^* value), redness value (a^*), yellowness value (b^*) value as 64.88 8.71 and 30.15, respectively. It had a pH value of 6.51, total soluble solid of 11.43 °Brix and viscosity of 121.33 cP. The sensory acceptances include appearance, color, taste, flavor (sweet) and overall acceptance were 7.00 6.90 6.91 7.16 and 7.10, respectively.

Keywords: Corn milk, Inulin, Japanese sweet corn

¹ Agronomy, Faculty of Agricultural Production, Maejo University, Chiang Mai, 50290

² Food Science and Technology, Faculty of Engineering and Agro-industry, Maejo University, Chiangmai, 50290

* Corresponding author email: ratchanee_pt@mju.ac.th

Development of sugar-reduced spread from pomelo

Piyada Limpitireungkit¹ and Siwaporn O'Chareon^{1,*}

Spreads are preparations of fruits which main preserving agent is sugar. Excessive consumption of sugar increases risks of several diseases such as diabetes. This research was aimed to develop sugar-reduced spread from pomelo to add value to Thai fruits and to be alternative for consumers. Including investigating the change during storage. Isomaltulose was used to substitute sucrose for 40 and 60% (w/w) in pomelo spread. The 60% isomaltulose substitution sample had the lowest total sugar content but from sensory evaluation found that the 40% isomaltulose substitution sample had an overall liking score over than the 60% substitution sample. Therefore, the 40% isomaltulose substitution sample was taken to investigate the change during storage at 30 and 50°C for 28 days. The sample kept at 50°C had lower lightness (L*), redness (a*), yellowness (b*), and pH value compared to sample at 30°C. The sample at 28 day-storage showed changes of L*-, a*-, b*-, and pH values compared to the initial sample. The result showed that high temperature and long-time storage resulted in darker color of sample.

Keywords: Isomaltulose, Pomelo, Spread, Sugar reduction, Sweetener

¹ Product Development, Faculty of Agro-Industry, Kasetsart University

* Corresponding author email: fagispo@ku.ac.th

Impact of extraction methods and solvents on antioxidant and anti-inflammatory activities of *Etlingera pavieana* rhizomes

Jongkonnee Padungkasem^{1,2}, Ekaruth Srisook^{2,3} and Klaokwan Srisook^{1,2,*}

Etlingera pavieana, a member of the Zingiberaceae family, has been used as a spice and herbal medicine due to its numerous biological activities, including anti-inflammatory, antioxidant, and anticancer effects. This study examined the effect of different solvents and extraction techniques on the antioxidant and anti-inflammatory effects of *E. pavieana* rhizomes. Methanol and ethanol with concentrations of 95%, 70%, and 40% (v/v) were used for extraction through maceration and reflux methods. The percentage yield of methanol and ethanol extracts from both methods was not significantly different except for the 95% ethanol extract, which was lower than the other extracts. Antioxidant activity was assessed using DPPH scavenging activity assay, and the total phenolic content was measured with the Folin-Ciocalteu method. Anti-inflammatory activity was measured through the inhibition of nitric oxide production in LPS-stimulated RAW 264.7 macrophages. All extracts were found to have comparable cell viability to control cells at a concentration of 50 µg/mL. The 95% ethanol extracts from both maceration and reflux methods exhibited higher antioxidant and nitric oxide inhibitory effects than the 70% and 40% extracts ($p < 0.05$). Moreover, the bioactivities of *E. pavieana* rhizome extracts using refluxing were found to be superior to those obtained through the maceration method ($p < 0.05$). The data suggest that the 95% ethanol extract obtained via the reflux method exhibited the highest levels of both antioxidant and anti-inflammatory activities. These results provide fundamental information for the production of *E. pavieana* rhizome extracts, which may be developed into dietary supplements or functional foods to prevent inflammation-related diseases.

Keywords: Anti-inflammatory activity, Antioxidant activity, *Etlingera pavieana*, Maceration, Reflux

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Research Unit of Natural Bioactive Compounds for Healthcare Products Development and Center of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University

³ Department of Chemistry, Faculty of Science, Burapha University, Chonburi, 20130

* Corresponding author email: klaokwan@go.buu.ac.th

Efficiency of antibacterial activity from crude extract of *Cannabis sativa* subsp. *Sativa*

Lakkana Meesang¹, Kornkamon Wongchu¹, Pimnara Thulathan¹ and Piyanoot Jaihan^{2,*}

The purpose of this study was to investigate the potential use of crude extract of flowers, leaves and stems from hemp (*Cannabis sativa* subsp. *sativa*) to inhibit the growth of *Bacillus cereus*, *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella* sp., *Acinetobacter* spp. and *Vibrio cholerae*. The samples of hemp were extracted using 95% ethanol and then processed using a rotary evaporator to obtain the crude extract. The experiment consisted of three parts including Agar well diffusion method, Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) by Broth Macro dilution. The results showed that the six types of tested bacteria exhibited varying responses to crude extracts from the flowers, leaves, and stems of hemp. Of these extracts, the crude extract from the flowers of hemp was found to be the most effective in inhibiting both gram-positive and gram-negative bacteria, with *S. aureus* which is gram-positive bacteria being the most significantly affected, followed by *B. cereus*, *B. subtilis*, *Klebsiella* sp., *V. cholerae*, and *Acinetobacter* spp., respectively. The crude extract from the flowers of hemp had an MIC value of 0.0244 mg/mL and an MBC value of 0.0244 mg/mL against gram-positive bacteria, and an MIC value of 50-12.5 mg/mL and an MBC value of 50 mg/mL against gram-negative bacteria. In conclusion, this study demonstrates the effectiveness of the crude extract from different parts of hemp to be employed as a good natural antibacterial agent.

Keywords: Antibacterial activity, *Cannabis sativa* subsp. *sativa*, Hemp

¹ Piboonbumpen Demonstration School, Burapha University

² Science Classroom in University-Affiliated School Project, Faculty of Science, Burapha University

* Corresponding author email: piyanoot.ja@buu.ac.th

Screening for antifungal activity of purified compounds from *Clausena harmandiana* on human pathogenic fungi

Praewa Chanthanapodi^{1,*}, Thatpong Poonsawat¹ and Yordhathai Thongsri²

This work attempted to study the *in vitro* effect of purified compounds isolated from leaves and roots of *C. harmandiana* against human pathogenic fungi. Antifungal susceptibility test performed by disc diffusion assay against 7 strains of human pathogenic fungi including *Aspergillus flavus*, *Rhizopus* sp., *Scedosporium apiospermum*, *Abisidia* sp., *Candida albicans*, *C. parapsilosis* ATCC22019 and *Cryptococcus neoformans*. Ten purified compounds were dissolved in ethyl acetate and methanol and tested at initial concentration of 10 µg/mL/disc (0.2 mg/disc). Then, prepared all solutions for 2-fold dilution, tested for their activity and MIC, incubated the tested plates at 25 °C for 72 hours, and observed for their inhibition zone around the tested disc. The results of compound 3 in methanol could inhibit all 3 strains of yeast. Compounds 5 and 10 in ethyl acetate showed the inhibition of growth of both *C. parapsilosis* ATCC22019 and *C. neoformans*, while compounds 4, 6, 7, and 8 showed the activity against only *C. neoformans* and compound 9 against only *C. parapsilosis* ATCC22019. In addition, compound 6 in methanol showed the greatest inhibition zone and the MIC was 0.3125 µg/mL/disc (6.25×10^{-3} mg/disc), while all compounds could not affect the mycelial growth of all mold strains. The cytotoxic effects of compound 6 on the human fibroblast cell line showed that the IC₅₀ by MTT assay was 50 µg/mL. However, the understanding of the mechanism of active compounds needs to be further explored. The results may contribute to developing antimicrobial drugs for the treatment of fungal disease in the future.

Keywords: Antifungal activity, *C. harmandiana*, Natural purified compound, Pathogenic fungi

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

² Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

* Corresponding author email: praewac64@nu.ac.th

Antioxidant and antimicrobial activities of Sangyod rice sprout extract and utilization in jelly

Palida Buresree¹, Thanchanok Chitnarong¹, Nattakarn Daengmanee²
and Preuttiorn Supaphon^{3,*}

Sangyod rice is a Geographical Indication (GI) and a major economic crop of Phattalung province. This research aims to evaluate the capability of Sangyod rice sprout extract for antimicrobial and antioxidant activities and develop jelly from these active extracts. Sangyod rice sprouts were prepared by extracting them with ethanol. The extracts were evaluated for their antimicrobial and antioxidant activities by using a colorimetric broth microdilution and DPPH assay, respectively. Four human pathogenic microorganisms (three bacteria and one yeast) were used in the antimicrobial test. The results showed that the extract from Sangyod rice sprout had good antimicrobial and antioxidant activities. The extract showed the best antibacterial activity against methicillin-resistant *Staphylococcus aureus* and *Escherichia coli* with MIC of 3.2 mg/ml. Whereas the extract gave antifungal activity against *C. albicans* and antibacterial activity against *S. aureus* with MIC of 12.8 mg/ml. Moreover, the extract showed antioxidant activity (DPPH assay) with IC₅₀ of 0.782±0.0109 mg/ml. The best active extract concentration was selected and used to develop jelly. Factors affecting the jelly's quality were studied, including the amounts of gelatins (14%, 16% and 17.5% w/w), and the concentration of the Sangyod rice sprout extract (0.25%w/w). The results showed that the hardness of gelly with 14% gelatin received the highest score. The jelly with 14% w/w of the extract also had the highest liking score on 9-point hedonic scale. Hence, the suitable formula of jelly from Sangyod rice sprouts extract was composed of 0.25% Sangyod rice sprout extract, 14% gelatin, 41.75% sugar, 1.5% citric acid and 40.75% water. These results showed that Sangyod rice sprout extract is a potential source of biological substances.

Keywords: Antimicrobial activity, Antioxidant activity, Jelly, Sangyod rice sprout

¹ Student, Paphayompittayakom School, SCiUS-Thaksin University, Phattalung, 93210

² Department of agrobiotechnology, Thaksin University, Phattalung, 93210

³ Department of Biology, Faculty of Science, Thaksin University, Songkhla, 90000

* Corresponding author email: orathai.sup@gmail.com

Vascular effect of lotus seed extract

Nuttarachai Wanput^{1,*} and Supravee Karvichar²

Lotus (*Nelumbo nucifera*) is a traditional medicinal plant. However, little is known about its pharmacologic and mechanisms of action on vascular function. Therefore, we determined the vasorelaxant effects and the underlying mechanism of lotus seed extract (LSE) in rat thoracic aortas. Isolated aorta rings (with or without intact endothelium) from rats suspended in the organ bath which contain the physiological Krebs's solution under a resting tension of 1 g to record isometric contractions. The rings were stimulated with phenylephrine (10 μM) to induce vasoconstriction, and subsequently treated with cumulative addition of LSE (1-1000 $\mu\text{g/mL}$). The results showed that LSE caused a concentration-dependent relaxation on endothelium-intact rings precontracted with PE. Preincubation of endothelium-intact rings with L-NAME (the blocker of nitric oxide synthases (NOS) or eNOS pathway blocker) significantly diminished LSE-mediated vasorelaxation. However, incubation of indomethacin (COX inhibitors) did not affect LSE-induced vasorelaxation. The results indicated that relaxation induced by the LSE exhibits mostly dependence on the eNOS pathway. In conclusion, LSE induces endothelium-dependent vasorelaxation through the eNOS pathway. These findings provide evidence to support the use of LSE as a medicine in the treatment of hypertension.

Keywords: Lotus seed, Vasorelaxant effect, Vasorelaxant mechanism

¹ Department of Biology, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Naresuan University Secondary Demonstration School, Phitsanulok, 65000

* Corresponding author email: nuttarachaiw64@nu.ac.th

Antifungal activity of medicinal plants against dermatophytes

Nunticha Rajitpruksa¹, Wachiraya Kanbuayaeng¹ and Sophit Khanthawong^{2,*}

Dermatophytosis is a skin disease caused by dermatophytes. There is limited research on medicinal plants for the treatment of dermatophytosis. This study focuses on evaluating the antifungal activity of Thai medicinal plants, *Quercus infectoria*, *Dracaena loureiri*, and *Curcuma longa* against dermatophytes; *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Microsporum gypseum*, *Microsporum canis*, and *Epidermophyton floccosum* and also develop the dermatophytosis treatment product. The herb powder was screened for the growth inhibition of dermatophytes by using the agar toxicity method. The results showed all herbs have the activity of inhibition against all strains of dermatophytes, except *C. longa* which cannot inhibit the growth of *M. canis*. The methanolic extract of *Q. infectoria* was tested for activity by the disc diffusion method. The results showed that 10 mg of the extract has an inhibition zone with *T. mentagrophytes* (16.0 ± 0.00 mm) and *M. gypseum* (14.0 ± 3.26 mm) while no inhibition zone could be observed on *M. canis*. The minimum fungicidal concentration of the extract by broth dilution was 20 mg/mL in *T. mentagrophytes* and *M. gypseum*. In addition, 20 mg/mL extract was added to the soap base to develop the antifungal product and tested for effect against *T. mentagrophytes* and *M. gypseum* compared to glycerin soap base using agar well diffusion. Finally, we have developed an herbal soap product with *Q. infectoria* extract which can be used for the treatment of dermatophytosis caused by *T. mentagrophytes* or *M. gypseum*. However, it is necessary to test for cytotoxicity before using this product in humans or pets.

Keywords: Antifungal activity, Dermatophytes, Medicinal plants

¹ Naresuan University Secondary Demonstration School, Phitsanulok

² Faculty of Medical Science, Microbiology and Parasitology, Naresuan University, Phitsanulok

* Corresponding author email: sophitth@nu.ac.th

Ecological services of water yield and water flow control of the Kaeng Krachan forest complex

Thammanoon Temchai^{1,*}

The purpose of this study was to assess the provisioning and regulating services of the ecosystem in terms of clean water, controlling the flow of water, and filtering clean water of the Kaeng Krachan forest complex. The seasonal water yield model of the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) software was used. The result showed that the forest complex covered with 4,774.91 square kilometers by climax forest (94.7 percent of the total area) providing baseflow and quickflow water of 906.40 and 372.82 million cubic meters per year, respectively. While the state of all areas was bare soil, the amount of baseflow will decrease to 76.83 million cubic meters and the amount of quickflow will increase to 2,386.24 million cubic meters per year. The monetary value of good-quality water provisioning, the value of reducing low-quality water, and the total value were 414,785, 52,126.93, and 466,911.93 million baht per year, respectively.

Keywords: Ecosystem services, Kaeng Krachan Forest Complex, Runoff, World heritage

¹ Petchburi, National Parks Research center

* Corresponding author email: dhamma57@gmail.com

Bird diversity and community composition in planted forests, Nan Province

Raekkhwan Polthanya¹, Nipada Ruankaew Disyatat² and Pongchai Dumrongrojwatthana^{2,*}

The objective of this research was to explore bird species diversity, community composition, and classify birds by their feeding guilds in 4 different ages of planted forests, Nan province. Bird species and abundance were surveyed using the point count method with a 20-meter radius at 4 points per study site. Then, species richness, Jaccard's similarity coefficient, and relative abundance were calculated. Then, birds were classified by feeding guilds. The research found 12 orders, 32 families and 65 species of birds. Each planted forest had varying diversity, abundance, and community composition of birds. Higher species similarity was observed in the planted forests of similar ages. All feeding guilds were found in the 5-year-old planted forest, including frugivores (e.g., black-crested bulbul), granivores (e.g., scaly-breasted munia), and insectivores (e.g., ashy woodswallow) as dominant groups. The 2-year-old and 7-year-old planted forests were dominated by insectivores (e.g., barn swallow and gray-breasted prinia) and granivores (e.g., scaly-breasted munia and red collared-dove) due to the characteristics of being open and grass-covered areas. Finally, insectivores (e.g., striated swallow) dominated the 3-year-old planted forest due to the open area and partially covered with grass. Consequently, the forest plantations had a potential in providing diverse ecosystem services because of various feeding guilds of birds that were found even in the young-planted forest.

Keywords: Bird, Community composition, Diversity, Feeding guilds, Planted forest

¹ M.Sc. Program in Zoology, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

² Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

* Corresponding author email: pongchai.d@chula.ac.th

Preliminary field application of tea bag method for root decomposition study in an estuarine mangrove forest at Trat Province

Nada Yimatsa¹, Sasitorn Poungharn¹, Suthathip Umnouysin² and Chadtip Rodtassana^{1,*}

Root decomposition study is critical for determining the amount of carbon transfer within mangrove ecosystems. The traditional litterbag method requires large amounts of roots and long processing time. Recently, the “tea bag method” was developed as a standard method that reduces time for sample preparation. This study aims to apply the tea bag method for decomposition study in mangrove forest in the dry season and wet seasons in a mangrove forest at Trat River Estuary. Litterbags contained dried green tea leaves were buried in the soil. The results showed that the patterns of tea leaf decomposition in both seasons were consistent with root decomposition of several mangrove species including rapid and slow phases of decomposition. The decomposition rate of tea leaves in the dry season was lower than that of the wet season (0.024 and 0.032 day⁻¹, respectively). Higher salinity of water and soil in the dry season might inhibited microbial activity involving in decomposition. Our results demonstrate that the applied tea bag method could reflect patterns of the decomposition occurring in mangrove soil, but the decomposition rate of tea leaves was higher than that of mangrove roots. We suggest that a combination of traditional litter bag method and tea bag method might improve an accuracy of carbon flux estimation.

Keywords: Carbon, Decomposition rate, Litterbag, Salinity

¹ Department of Botany, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

² Department of Biology, Faculty of Science, Silpakorn University, Nakhon Prathom, Thailand 73000

* Corresponding author email: chadtip.r@chula.ac.th

A Development AI application for identification of wild mushroom species on iOS operating system

Khwanruan Naksuwankul^{1,*}, Ajjima Thongbor², Chuleeporn Chantharasena²,
Weeranuch Khottawong², Chotika Ong-ardnarong³, Sittiporn Parmen⁴,
Nattakarn Nooron⁴ and Sujitra Sikaphan⁴

The researches and developments of an artificial intelligence (AI) tool for identifying wild mushrooms species using an iOS operating system probably help many people to differentiate edible mushroom from poisonous mushroom. The objective of this study is to develop a tool for the identification of poisonous and edible mushrooms species using the morphological similarity of the iOS operating system. The database including twenty two mushrooms species were compared with similar morphology such as *Chlorophyllum molybdites* and *Macrolepiota dolichaula*, *Inosperma* cf. *viosum* and *Termitomyces* sp., *Amanita brunneitoxicaria* and *Amanita vaginata*, *Amanita exitialis* and *Amanita princeps*, *Lecinum* sp. and *Phlebopus braunii*, *Russula subnigricans* and *Russula adusta*, *Scleroderma sinnamariense* and *Mycoamaranthus cambodgensis*, *Cantharocybe virosa* and *Macrocybe crassa*, *Psathyrella candolleana* and *Coprinus comatus*, *Russula sanguinaria* and *Russula emetica*, *Entoloma* sp. and *Termitomyces clypeatus*. All mushrooms were taken the pictures in 1,000 of each species and adding to the databases in the cloud. Edible and poisonous mushrooms are very similarity of morphological with makes a confusion causing severely illness. The AI application identified mushroom species by real time scanning on the fruiting body with comparing image from a database operating system, that shows the percentage of accuracy with 95% of operating system will stop then give the mushroom name and the description. The AI of classification of Thai mushroom includes the data of a morphology, image for comparison, the symptoms of poison when eating poisonous mushrooms, and preliminary health care data when getting poison from mushrooms. Therefore, the application tool may be used for decision screening of wild edible mushrooms.

Keywords: Application, Artificial intelligence, Edible mushroom, iOS Operating System, Poisonous mushroom

¹ Department of Biology, Faculty of Science, Mahasarakham University, Maha Sarakham Province, 44150

² Regional Medical Sciences Center 8 Udonthani, Udonthani Province, 41330

³ Regional Medical Sciences Center 10 Ubonratchathani, Ubonratchathani Province, 34000

⁴ Toxicology, National Institute of Health, Department of Medical Sciences, Ministry of Public Health
Nontaburi, 11000

* Corresponding author email: khwanruan.p@msu.ac.th

The species composition and abundance of marine fish on artificial reef (Fish Dome) at Samae Sarn Island, Chon Buri Province

Ason Meenapha^{1,*} and Vipoosit Mantrachitra²

The composition and abundance of marine fish were collected on fish domes off the eastern coast of Samae Sarn island for 25 months, from March 2018 to March 2020, the composition and abundance of marine fish were collected on fish homes off the eastern coast of Samae Sarn island for 25 months. The video census corrected the data on fish homes, a total of 100 sticks, in five stations. Each station was divided into five groups, each with four fish homes. Were found 99 species of marine fish from 36 families. Pomacentridae is the dominant family (11 species), followed by Labridae and Gobiidae (8 species). However, at least seven species of fish have been found in the fish home area that have not been reported in the coral reefs of Samae Sarn island, such as Janss' pipefish (*Doryrhamphus janssi*), Spotted porcupinefish (*Diodon hystrix*), Map puffer (*Arothron mappa*), Half-barred goby (*Priolepis semidoliata*), Bearded Leatherjacket (*Anacanthus barbatus*), Spotcheek emperor (*Lethrinus rubrioperculatus*), and Three-striped whiptail (*Pentapodus trivittatus*). This study demonstrated the importance of fish domes and their role in enhancing the condition of coral reef ecosystems. Building fish domes around Samae Sarn island has a positive result on the coral reef ecosystem, especially coral reef fishes and marine fishes in this area. This result illustrates a good effort by humans to restore or enhance natural resources. The output of this study was knowledge of coral reef conservation which leads to the sustainability of natural resources.

Keywords: Abundance, Artificial reef, Coral reef fish, Marine fish, Samae Sarn

¹ Institute of Marine Science, Burapha University, Chon Buri, 20131

² Department of Aquatic science, Faculty of Science, Burapha University, Chon Buri, 20131

* Corresponding author email: ason@buu.ac.th

**Diversity of phototrophic euglenoid protozoa (Euglenozoa) related to water
quality during the rainy season time period in Mae Moei Reservoir,
Mae Tha District, Lamphun Province**

Phitsanuphakhin Chaimongkhon^{1,*} and Kewalin Sukkad²

Some of the physical, chemical, and biological properties of the water in Mae Moei Reservoir were studied at three sampling sites during the rainy season, from May to August 2020. The objectives were to study and evaluate the physical and chemical properties of water, to study the diversity of phototrophic euglenoids during the rainy season, and to study the relationship with various water quality parameters. The water quality was assessed with an AARL-PC score and compared to surface water quality standards. It was found to be a type 3 water source with clean to moderate water quality and oligo-mesotrophic status. A total of 30,012 cell/l of euglenoid cell average density were found in 6 genera and 32 species. Notable species found as dominant species were *Phacus longicauda* (Ehrenberg) Dujardin, *Eulena proxima* P. A. Dangeard, and *Trachelomonas armata* (Ehrenberg) F. Stein. In the MM1 sampling site in July and August, there were 13 species of euglenoids with the highest diversity indices of 2.47 and 2.48, respectively. The species *E. proxima* P. A. Dangeard showed very high positive correlations with orthophosphate and conductivity, and a high negative correlation with secchi depth and pH value. The species *Lepocinclis oxyuris* (Schmarda) B. Marin & Melkonian had a very high degree of positive correlation with conductivity.

Keywords: Correlation, Diversity index, Euglenoids, Water quality

¹ Department of Biology, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai 50300

² Biology Program, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai 50300

* Corresponding author email: phitsanuphakhin_cha@cmru.ac.th

The prediction of Eutrophication with factors of water quality and phytoplankton

Vichaya Gunbua^{1,*} and Apisak Chairojwattana¹

Eutrophication is caused by excess nitrogen and phosphorus concentration in bodies of water source. These nutrients will stimulate the phytoplankton in the water bodies to have more photosynthesis and rapid growth. This research want to create a model to predict the occurrence of this phenomena from the various factors through logistic regression analysis. This study will focus on the phenomenon of eutrophication from water quality factors and phytoplankton in water resources which consists of pH (pH), Temperature (Temp), Dissolved oxygen (DO), Conductivity (Cond), Phytoplankton (Phyto), Zooplankton (Zoo), Cyanobacteria (Cyano), Green algae (GAI) and Golden-brown algae (GBAI). The results revealed that water quality factors affecting the prediction of algal bloom phenomenon were phytoplankton and cyanobacteria and the logistic regression equation is

$$p_i = \frac{e^{(-1.742-0.000012Phyto+0.000017Cyano)}}{1 + e^{(-1.742-0.000012Phyto+0.000017Cyano)}}$$

with a 86.76% predictive efficiency.

Keywords: Eutrophication, Logistic regression, Phytoplankton

¹ Faculty of science, Burapha University, 20131

* Corresponding author email: vichaya@buu.ac.th

The application of an echo sounder to investigate the shoal of fish in the fish shelters at Samae San Island, Chonburi Province

Thanyaporn Tianubol¹, Pakornwan Luangkasemnit¹, Pakwan Thawon¹
and Anukul Buranapratheprat^{2,*}

In the sea on the east coast of Samae San Island Chonburi Province under Plant Genetic Conservation Project Under the Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG), an artificial coral structure called “fish shelters” was installed to provide a safe house and the growth of marine life in that area instead of the lost coral reefs. This study used an echo sounder to study the fish in the fish shelter area by comparing the difference with neighboring sites without fish shelters installed. We installed an echo sounder on the ship and explored the area of Koh Samae San, where the fish shelters were installed, and areas without installing fish shelters, which are natural corals. For the first survey in December 2022, the most common size of the fish shoal was 0-5 square meters, accounting for 56% of the surveyed. The biggest was 47.6 square meters and the smallest size was 0.5 square meters. For the second survey in February 2023, the most common size of the fish shoal was 0-10 square meters, accounting for 79.3% of the surveyed. The biggest fish shoal was 66 square meters and the smallest size was 0.4 square meters. The results of the first and second surveys were similar, indicating that the number of fish in the area where the artificial coral was established was comparable to that of the natural coral area. This study demonstrates that effective artificial coral reefs can be a new habitat for marine life in the replacement of natural corals.

Keywords: Coral reef, Echo sounder, Fish shelters, Samae San Island

¹ Piboonbumpen Demonstration School, Burapha University

² Department of Aquatic Sciences, Faculty of Science, Burapha University

* Corresponding author email: anukul@buu.ac.th

Coastal bottom topography mapping using market grade side scan sonar

Nut Boongon¹, Penchan Laongmanee¹ and Wirote Laongmanee^{1,*}

Study of the coastal bottom topography, Laem Klat Subdistrict, Mueang District, Trat Province by using the Side Scan Sonar machine in the market, the Sensor “Lowrance Active Imaging 3-in-1 Transducer” with a frequency of 800 MHz for the Side Scan Sonar and 200 MHz for the Echo Souder connected with a 7-inch Lowrance HDS monitor that receives GPS signals to locate. Temporary installation of the survey set on a local fishing boat of about 2.5 gross tons or about 5 wa (10 meters) long, for 3 trips on November 13, 2022, February 3, and March 11, 2023. Recorded seafloor data in a total area of 6.4 square kilometers or 4,000 rai, processed data by ReefMaster-2 program set, classified seabed data visually and assessed hardness and roughness of the sea floor with the add-on module “Bottom Composition”. The result was found that more than 400 objects that are not related to the natural sea bottom and more than 160 small fish schools, the describe bottom with the sand area and muddy area can be mapped. Mapping the coastal topography and substate by the QGIS program. Market-grade side scan sonar is five times cheaper cost when compared with the high-precision survey grade and can support the follow-up of the area utilization measures. However, the result of this method needs more verified with other sources of data to make the acceptable accuracy.

Keywords: Coastal Bottom Topography Mapping, Laem Klat Coastal, Side Scan Sonar

¹ Faculty of Marine Technology, Burapha University Chanthaburi campus, 57, Moo 1, Chonpatan road, Kamong, Thamai, Chanthaburi 22170

* Corresponding author email: wirote_jao@buu.ac.th

**DNA barcodes diversity of *Apis cerana* Fabricius, 1758
from apicultural and natural breeding area**

Rujira Chandaeng^{1,*} and Tipwan Suppasat¹

Eastern honey bee, *Apis cerana indica* is a native bee distributed throughout Thailand and has widespread for beekeeping. This study aims to examine the genetic diversity of the DNA barcode. The PCR and DNA sequences were determined in *A. cerana indica* for 78 colonies, they were grouped for Phayao (N=54), Phetchaburi (N=14), Chanthaburi/Chon Buri (N=5) and Chumporn (N=5). Also, there were *A. cerana cerana* (N=3) and outgroup was *A. florea* (N=1). The PCR product of the DNA barcode found for 5 haplotypes. While, nucleotide sequences showed 49 haplotypes which haplotype diversity (Hd) was 0.9620 and nucleotide diversity (Pi) was 0.0230. Nucleotide divergence among group of *A. cerana indica*, the southern, the northern and *A. cerana cerana*, were 0.0295-0.0473. In the northern *A. cerana indica* were between 0.0011-0.0017. The northern group and *A. cerana cerana* were between 0.0015-0.0030. These were consistent with the phylogenetic relationships. It can be concluded that the northern *A. cerana indica* are more closely related to *A. cerana cerana* than the southern. The diversity of DNA barcodes supports that the adaptation of *A. cerana* in new areas. Therefore, DNA barcoding can be applied to monitor the invasion of *A. cerana* populations in new or natural beekeeping areas.

Keywords: *Apis cerana*, DNA barcode, Phylogenetic tree, Polymorphism

¹ Program in Biology, School of Science, University of Phayao, Maeka, Mueng, Phayao 56000

* Corresponding author email: 62081041@up.ac.th

**Genetic analysis of *Corbicula fluminea* (Müller, 1774) (Bivalvia, Corbiculidae)
in native southeast Asian range**

Poorit Pootanon¹, Chalita Kongrit¹ and Ekgachai Jeratthitikul^{1,*}

Freshwater clam *Corbicula fluminea* is native to Asia. Today, it is also widely distributed in North and South America, and Europe, where it is an invasive aquatic pest. Despite their large number and extensive distribution range, genetic diversity of the invading populations is extremely low. The present study investigates genetic lineages and evaluates the genetic diversity of *C. fluminea* in its native Southeast Asian range. A total of ten unique haplotypes of cytochrome c oxidase subunit I (COI) sequence were obtained from 55 *C. fluminea* samples collected from eight localities in Thailand, Laos PDR, and Vietnam; eight of these were newly identified haplotypes. The phylogenetic tree and haplotype network revealed *C. fluminea* as a monophyly, and likely containing two groups: the native and the widespread groups. The native group comprised *C. fluminea* solely from Southeast Asia and southern China, whereas the widespread group consisted of the globally common haplotype FW5 and two haplotypes newly identified in this study. The haplotype diversity and nucleotide diversity were 0.687 ± 0.055 and 0.00510 ± 0.00033 , respectively, which were much higher than those reported in invaded areas. Further investigation on genetic structure of native populations of *C. fluminea* using microsatellite markers is recommended.

Keywords: COI, Genetic diversity, Haplotypes, Invasive species, Southeast Asia

¹ Animal Systematics and Molecular Ecology Laboratory, Department of Biology, Faculty of Science, Mahidol University, Bangkok 10400

* Corresponding author email: ekgachai.jer@mahidol.edu

**Ecology and Biodiversity studies of the big-headed turtle
(*Platysternon megacephalum* Gray, 1831) using molecular technique
for recovery plan and reintroduction population in
Phu Sang National Park, Phayao Province**

Pitchaphon Athitphokinchok¹ and Chatmongkon Suwannapoom^{1,*}

The big-headed turtle *Platysternon megacephalum* Gray, 1831, is among the five endangered turtles and tortoises in Thailand. Due to the threats posed by human hunting for consumption, trade, and habitat degradation, it has been classified as an endangered species on the IUCN Red List. The aim of this research is to examine the ecology, morphology and genetic diversity of this species. Field surveys were conducted at eleven stations from 2019 to 2021. Morphological variations were analyzed based on morphometric, meristic, and descriptive external characteristics. Moreover, genetic diversity was assessed based on mitochondrial 16S rRNA and Cytochrome Oxidase I (COI) sequences (n = 31, 1,218 bp) extracted from blood samples from tails of the big-headed turtles. The result showed that the Big-headed turtles were found at five out of eleven stations. Three haplotype characters of Phu Sang population were identified, and low genetic diversity indices were observed in terms of haplotype diversity and nucleotide diversity ($h = 0.546$ and $\pi = 0.00065$). For this project, the environmental DNA (eDNA) method was developed, which has proven to be a valid tool for detecting or monitoring natural big-headed turtle populations. Specific primers and probe that amplify a 150 bp fragment of the COI region of the big-headed turtle were designed and confirmed for their specificity. These results contribute to the rapidly expanding field of eDNA for tracking or surveying of the big-headed turtle and have conservation implications for the future.

Keywords: Big-headed turtle, Genetic diversity, Molecular technique, Morphology, Phu Sang National Park

¹ Division of Fisheries, School of Agriculture and Natural Resources, University of Phayao, Phayao, 56000

* Corresponding author email: chatmongkonup@gmail.com

Development of a biosensor assay for *Ascaridia galli* detection in chicken faeces using LAMP coupled with lateral flow technology

Wasin Panich¹, Thanawan Tejangkura^{1,2} and Thapana Chontanarath^{1,2,*}

Ascaridia galli is an important nematode that causes ascariidiasis in free-range chicken farms. Infection with *A. galli* damages the intestinal mucosa and inhibits nutrient absorption, leading to a reduced growth rate, weight loss, decreased egg production, and finally death. Consequently, *A. galli* infection is considered to be a significant health problem in chickens. In this study, we developed a loop-mediated isothermal amplification integrated with a lateral flow dipstick (LAMP-LFD) assay for the visual detection of *A. galli* infection via faecal samples. Using the developed LAMP-LFD assay could be specifically detected *A. galli* within 70 min without any cross-reaction with other related parasites and hosts. Regarding analytical sensitivity, the minimum detectable DNA concentration was 5 pg/ μ L, and the detectable egg count was 50 eggs per reaction. Moreover, the assay could detect *A. galli* via chicken faeces ($n=30$) using a simple water bath without costly laboratory instruments. As a result, the LAMP-LFD and microscopic examination showed moderate agreement with *A. galli* with kappa > 0.6, however, we recommend that the inhibitors should be eliminated from faeces as well as possible, such as simple filtration using gauze before DNA extraction for efficiency improvement. Therefore, the feasible use of this assay as an alternative method for field screening or a small laboratory scale with a lack of specialised equipment to diagnose and suggest farm management and further solve chicken health problems caused by *A. galli*.

Keywords: *Ascaridia galli*, DNA Biosensor, Lateral flow dipstick, Loop-mediated isothermal amplification, Visual interpretation

¹ Applied Parasitology Research Laboratory, Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok, 10110, Thailand

² Research and innovation unit for diagnosis of medical and veterinary important parasites, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

* Corresponding author email: thapana@swu.ac.th

Epidemiological evaluation for gastrointestinal helminth infection in cattle from Surat Thani and Khon Kaen Provinces using microscopic and molecular based coprological examinations

Sirapat Nak-on¹ and Thapana Chontanarath^{1,2,*}

Cattle's feces ($n = 70$) from Surat Thani ($n = 30$) and Khon Kaen ($n = 40$) provinces were collected in March and October 2021, respectively. Convenience sampling method was conducted in the study areas. For gastrointestinal helminth examination, the feces had processed in microscopic methods, including sedimentation and flotation. Prevalence of overall helminth in this study was 68.6% (48/70), including 76.7% (23/30) for Surat Thani and 62.5% (25/40) for Khon Kaen. The results revealed single infection (30.0%) and mixed infection (34.3%). Total helminths in this study comprised (i) trematodes (32.9), including *Fasciola* (20.0%), rumen fluke or paramphistome (14.3%), and *Dicrocoelium* (5.7%); (ii) nematodes, including *Haemonchus* (18.6%), *Ostertagia* (17.1%), *Cooperia* (17.1%), *Trichostrongylus* (12.9%), *Strongyloides* (10.0%), *Oesophagostomum* (7.1%), *Trichuris* (2.9%), *Capillaria* (2.9%), *Bunostomum* (2.9%), *Toxocara* (1.4%), and *Dictyocaulus* (1.4%); and (iii) unidentified helminth eggs (18.6%). Then, examined results were illustrated in epidemic map to epidemiological investigate the geographical distribution of helminths. Similar morphological characteristics of various helminth egg can lead to misidentification. In this study, specific-helminth PCR and specific-paramphistome LAMP techniques from previous studies were applied to detect the ITS2-DNA and to compare with the microscopic results. Different percentages of positive results from each method, microscope (20.0% for helminth; and 14.3% for paramphistome) and molecular techniques (18.6% for helminth; and 11.4% for paramphistome), suggested that suitable coprological examination should be selected for various parasite detections and research objectives. The microscopic examinations revealed the epidemic situation of several helminths, and validated molecular tools could support the accuracy of detection and diagnosis.

Keywords: Cattle, Epidemiology, Loop mediated isothermal amplification (LAMP), Microscope, Parasite

¹ Applied Parasitology Research Laboratory, Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110

² Research and innovation unit for diagnosis of medical and veterinary important parasites, Faculty of Science, Srinakharinwirot University, Bangkok 10110

* Corresponding author email: thapana@g.swu.ac.th

**Genetic variation of *Cyclocheilichthys enoplos* in the Mekong River,
Nong Khai Province, Thailand**

Benchaphan Charoenying¹, Ratchaneegorn Mapanao¹ and Arpakorn Sakulsathaporn^{1,*}

This study presents the first initiation genetic diversity assessment of *Cyclocheilichthys enoplos*, a fish species native to the Southeast Asia region that plays an important role in the local economy as a food source. Start Codon Targeted (SCoT) markers (9 primers) were used to evaluate the genetic diversity of three wild populations located in the Mekong River, Nong Khai province, Thailand. A total of 28 specimens were tested using nine markers to examine genetic structure and diversity. The results showed that 158 loci were amplified and polymorphic, with polymorphic loci ratios ranging from 48.40-85.54% across the three populations. The population from Rattanawapee (RP) showed the highest level of polymorphism, while the population from Sangkhom (SK) exhibited the lowest polymorphism. The Nei's gene diversity (H_e) and Shannon's Information index (I) ranged from 0.195-0.296 and 0.285-0.444, respectively. The dendrogram based on Nei's (1978) genetic distance and the phylogenetic tree generated using NTSYS-PC software revealed two distinct groups. Analysis of molecular variance (AMOVA) indicated that the majority of the variation was within populations (87%), while the differences between populations were relatively low (13%). This study provides preliminary information for the management of *Cyclocheilichthys enoplos* in this region.

Keywords: *Cyclocheilichthys enoplos*, Genetic diversity, Mekong River

¹ Faculty of Interdisciplinary Studies, Khon Kaen University, Nong Khai

* Corresponding author email: arpasa@kku.ac.th

**Cytogenetics of exotic fish species Red-Bellied Pacu
Piaractus brachypomus (Cuvier, 1818) in Thailand**

Chakrit Somkhayan¹ and Kanya Anukulthanakorn^{1,*}

This research aimed to study the standard karyotype, ideogram and chromosome marker of red-bellied pacu (*Piaractus brachypomus*), an exotic fish species in Thailand. The kidney was used to prepare for the metaphase chromosome with conventional staining by 20% giemsa and silver nitrate staining for NOR chromosome marker. The results showed that red-bellied pacu had 54 diploid chromosome ($2n$) and the fundamental number of chromosome (NF) was 108 which consists of 28 large metacentric chromosome (L^m) and 26 large submetacentric chromosome (L^{sm}). The karyotype formula is $2n (54) = L^m_{28} + L^{sm}_{26}$ and NOR marker was located in the long arm of chromosome 6 submetacentric.

Keywords: Chromosome, Karyotype, Ideogram, Red-bellied pacu

¹ Department of Science, Faculty of Science and Technology, Nakhonsawan Rajabhat University, Nakhon Sawan 60000

* Corresponding author email: kanya.k@nsru.ac.th

Constructed wetland with water hyacinths (*Eichhornia crassipes*) reduces the chromosomal aberration in the swamp eel (*Monopterus albus*)

Nadthida wannarod¹, Thitiwattana Chunawat¹, Wipasiri Soonthornchai^{1,2}
and Kriengkrai Seetapan^{3,*}

The wastewater from many buildings of the University of Phayao is released to a tributary that flows into the Huai Tap Chang reservoir. This tributary also consists of constructed wetland with water hyacinths (*Eichhornia crassipes*). In addition, the contaminants typically precipitate to bottom, affecting the aquatic animals, who live in the ground like a swamp eel (*Monopterus albus*). Therefore, the objective of this study is to investigate the chromosomal aberration of the swamp eel (*Monopterus albus*) from 3 areas, including pre-treatment (PrT), post-treatment (PoT) and unaffected area (UA; Fisheries Training Area, School of Agriculture and Natural Resources, University of Phayao). The results demonstrated that the cell numbers containing the chromosomal aberrations in *M. albus* were significantly different ($p < 0.05$) in PrT, PoT and UA with 94.25 ± 8.50 , 74.00 ± 15.10 and 2.67 ± 2.08 , respectively. The total number of chromosomal aberrations were also significantly different ($p < 0.05$) in PrT, PoT and UA with 427.25 ± 147.67 , 185.00 ± 93.79 and 3.00 ± 1.73 , respectively. In addition, 10 types of chromosomal aberration, including centric fusion (CF), centric gap (CG), single chromatid gap (SCG), sister chromatid gap (SSCG), ring chromosome (Ring C), dicentric chromosome (DC), deletion (D), fragmentation (F), polyploid (P) and single chromatid break (SCB) were found.

Keywords: Chromosomal aberration, Constructed wetland, *Eichhornia crassipes*, *Monopterus albus*, Wastewater

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

² School of Science, University of Phayao, Phayao 56000, Thailand

³ School of Agriculture and Natural Resources, University of Phayao, Phayao 56000, Thailand

* Corresponding author email: kook82@hotmail.com; kriengkrai.se@up.ac.th

Rapid DNA extraction from canine blood samples by polymerase chain reaction and recombinase polymerase amplification techniques

Apisit Cheukaw¹, Suphaporn Paenkeaw¹ and Kittisak Buddhachat^{1,*}

The rapid DNA extraction is a crucial step for detecting pathogens using DNA-based methods at point-of-care testing. Usually, blood is used to diagnose infections in both humans and animals. This study aimed to develop a quick and simple DNA extraction technique for canine blood, enabling DNA amplification via PCR or recombinase polymerase amplification (RPA). Mitochondrial DNAs, specifically *cytochrome oxidase subunit I (COI)* and *cytochrome b (cytb)*, were used to assess the effectiveness of various DNA extraction methods, including DNAeasy extraction kit, tris-EDTA DNA extraction (TE), methanol DNA extraction, Chelex® DNA extraction, and boiling DNA extraction. Results showed that TE method was the best for DNA extraction, as DNA extracted by this method allowed for successful amplification of *COI* and *cytb* by both PCR and RPA with 90% accuracy. Additionally, DNA isolated using the TE method and stored at -20°C for four months remained positive. Therefore, the TE method could be an appropriate rapid DNA extraction technique for detecting pathogens in canine blood due to a simple, cost-effective, rapid and equipment-free method.

Keywords: Polymerase Chain Reaction, Rapid DNA Extraction, Recombinase Polymerase Amplification

¹ Department of Biology, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: kittisakbu@nu.ac.th

Cloning and sequence analysis of a novel leucine rich repeat (LRR) gene from *Streptococcus agalactiae*

Ravipa Ukritatsadorn^{1,*}, Jitapa Sunjareun¹ and Supachai Nitipan²

Leucine-rich repeat (LRR) proteins are a family of proteins containing tandem repeats of leucine residues. These proteins have potential as vaccine candidates and have been identified in pathogenic bacteria, such as *Streptococcus agalactiae*, which is known to cause streptococcosis in humans and animals, including aquatic species like Nile tilapia. The objectives of this study were to (1) identify the LRR gene in the *S. agalactiae* genome (NZ CP012480.1), (2) predict its transmembrane topology, (3) clone the gene using genetic engineering techniques, and analyze its nucleotide sequence. In total, 34 genes encoding LRR proteins were identified in the *S. agalactiae* genome, with one gene (WP_000230034.1) containing three LRR motifs and predicted to have nine transmembrane domains. Using PCR, a 1361 bp amplicon of WP_000230034.1 was amplified using specific primers (SgLRR_F and SgLRRin_R), cloned into the plasmid pCR4 using the TA cloning method, and transformed into competent *E. coli* TOP 10 cells. Positive clones were selected on LB agar supplemented with 100 mg/ml of ampicillin. The recombinant plasmid (pCR4-WP_000230034.1) was sequenced and analyzed, showing 99% sequence identity to the original WP_000230034.1 gene with LRR and transmembrane motifs. Overall, this study provides insight into the genetic makeup of LRR proteins in *S. agalactiae* and demonstrates the successful cloning and sequencing of a potential vaccine candidate gene. These findings may have implications for the development of new treatments for streptococcosis in aquatic species and beyond.

Keywords: Bioinformatics, Nile tilapia, Leucine rich repeat protein, *Streptococcus agalactiae*

¹ SciUS – TSU, Paphayompittayakom School, Phatthalung, 93210

² Department of Biology, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: 14109@tsu.ac.th

Dietary supplementation with *Cordyceps militaris* spent mushroom substrate extract and *Pediococcus acidilactici* TISTR 783 enhancing immune response and cytokine expression in Nile tilapia (*Oreochromis niloticus*)

Kanokkarn Choosong¹, Suphada Kiriratnikom², Akkanee Pewhom¹ and Supachai Nitipan^{1,*}

This study aimed to determine the effects of dietary supplementation on immune response of Nile tilapia. Fish were fed for 56 days with a control diet (T1), 20 mg/ml kg SMS extract (T2), 3.2×10^8 cfu/ml kg *P. acidilactici* TISTR 783 (T3), and a combination of 20 mg/ml kg SMS extract and 3.2×10^8 cfu/ml kg *P. acidilactici* TISTR 783 (T4). Fish had an initial body mass of 6.33 ± 0.08 g and were fed at a daily rate of 5-7% of their live weight, twice a day. At the end of the study, blood and head kidney samples were taken to determine the immune response. Results showed that Nile tilapia fed with 20 mg/kg SMS extract (T2) and the combination of 20 mg/kg SMS extract and 3.2×10^8 cfu/ml kg *P. acidilactici* TISTR 783 (T4) had significantly higher levels of RBC, WBC, hematocrit, respiratory burst activity and lysozyme activity compared to those fed with the control diet ($P < 0.05$). Moreover, *IL-1 β* and *IL-8* gene expressions also significantly increased in the kidney of fish supplemented with T4.

Keywords: Cytokine genes, Immunity, Probiotic

¹ Biology program, Faculty of Science, Thaksin University, Pa-Phayom, Phatthalung, 93210

² Aquacultural Biotechnology Research Unit, Faculty of Science, Thaksin University, Pa-Phayom, Phattalung 93210

* Corresponding author email: nisupachai@tsu.ac.th

**Effects of *Andrographis paniculate* extract on hematological indices,
lysozyme activity and cumulative mortality of hybrid catfish
(*Clarias macrocephalus* × *C. gariepinus*) after *Aeromonas hydrophila* injection**

Chitra Ear¹, Korntip Kannika¹, Sontaya Sookying², Chatmongkon Suwannapoom¹
and Paiboon Panase^{1,*}

The objective of this research was to study the effects of *Andrographis paniculate* extract at concentrations of 0 (control group), 0.2, 0.4 and 0.6 g/kg, respectively, on hematological indices, lysozyme activity and cumulative mortality in hybrid catfish (*Clarias macrocephalus* × *C. gariepinus*) continuously cultured for 90 days. After that, they were injected with *Aeromonas hydrophila* at a concentration of 10⁹ CFU/ml, 150 µl/fish and monitored for 14 days. Then, 3 fish/replicates were randomly sampled to study the total red blood cell, total white blood cell, hematocrit, lysozyme activity and cumulative mortality. The results showed that the total red blood cells, total white blood cells, hematocrit and serum lysozyme activity values of all groups fed with *A. paniculate* extract were significantly higher value than those of the control group (p<0.05) however, All groups fed with *A. paniculate* extract showed no significant difference (p>0.05). Meanwhile, the highest cumulative mortality was observed in the control group (60%) followed by the groups fed with 0.2 g/kg (50%), 0.4 g/kg (40%) and 0.6 g/kg (30%), respectively. If considering the values of total red blood cells, total white blood cells, hematocrit and serum lysozyme activity, it is demonstrated that the extract with a concentration of 0.2 g/kg was optimized for hybrid catfish culture commercially, and *A. paniculate* extract can be used as a guideline for organic aquaculture and applied to other aquatic animals.

Keywords: *Aeromonas hydrophila*, *Andrographis paniculate*, Hematology, Hybrid catfish, Lysozyme activity

¹ Division of Fisheries, School of Agriculture and Natural Resources, University of Phayao, Phayao, 56000

² Division of Pharmaceutical Sciences, School of Pharmaceutical Sciences, University of Phayao, 56000

* Corresponding author email: tong33_panamagigas@hotmail.com

Efficacy of coffee grounds for the elimination of *Ascaris suum* egg in sludge

Tassapon Kertsook¹, Sukhontha Siri², Suwanna Chaorattanakawee¹,
Wanarit Jitsamai¹ and Varakorn Kosaisavee^{1,*}

The prevalence of helminthiasis is more than 1.5 million people worldwide where helminth eggs have been reported in treated sludge from sewage treatment systems that can cause parasitic infection in humans. Currently, compounds in coffee grounds, including tannins, caffeine, and polyphenols, have been found to affect the survival of various pathogens and earthworms. Therefore, this study aimed to study the efficiency of coffee grounds for the elimination *Ascaris* eggs in sludge and to compare the embryonation rate of *Ascaris* eggs at each concentration of coffee grounds and different timepoints for elimination of *Ascaris* eggs. In this study, the sludge was divided into three groups, which were mixed with coffee grounds at concentrations of 1:4, 1:8 and without coffee grounds (negative control) with 300 *ascaris* eggs/g were added to each group and incubated for 0, 7 and 14 days and then *Ascaris* eggs were reared for 28 days. The results, the average recovery rate of *Ascaris* eggs after day 14 was 58.90% and the average embryonation rate at concentrations of 1:4, 1:8 and (negative control) was in 57.95%, 59.80% and 58.94% respectively. In addition, moisture was found in every experimental samples. Therefore, the higher concentration of coffee grounds should be increased, and moisture should be controlled not over 5% to further study on the methods for helminth eggs elimination in treated sludge to reduce the spread of infection to the environment.

Keywords: *Ascaris suum* egg, Coffee grounds, Sludge

1 Department of Parasitology and Entomology, Faculty of Public Health, Mahidol University, Bangkok, 10400

2 Department of Epidemiology, Faculty of Public Health, Mahidol University, Bangkok, 10400

* Corresponding author email: varakorn.kos@mahidol.ac.th

**Effect of solvents on anthocyanin extraction from the seed and seedling of
Khao Kum Phayao (*Oryza sativa* var. *glutinosa*)**

Nanthawat Jinasan¹ and Sumana Leangthitikanchana^{1,*}

This research studied the suitable solvents for anthocyanin extraction from the seeds and seedling of Khao Kum Phayao (*Oryza sativa* L.) by pH differential method. The efficiency of 3 solvents; distilled water, 95% ethanol and 70% methanol were compared. The results showed that anthocyanin extraction from the seed, 3- and 7- days old, seedling by using 70% methanol provided the highest anthocyanin contents (47.32±0.17, 14.47±0.1 and 6.68±0.02 mg/g, respectively), followed by using 95% ethanol as a solvent that gave 19.49±0.07, 6.12±0.012 and 3.34±0.01 mg/g, respectively. Whereas, distilled water gave the least anthocyanin contents 16.70±0.06, 8.07±0.03 and 3.06±0.01 mg/g, respectively. In addition, anthocyanin extraction from the seed gave higher anthocyanin content than that from the seedling.

Keywords: Anthocyanin, Extraction, Khao Kum Phayao (*Oryza sativa* L.), pH-Differential method, Solvent

¹ Department of Biotechnology, School of Agriculture and Natural Resources, University of Phayao, Muang, Phayao 56000

* Corresponding author e-mail: sumana.le@up.ac.th

Effect of nitrogen sources of cordycepin production from *Cordyceps militalis*

Wichuda Klaweck^{1,*}

Nowadays, the cultivation of Tung-chao mushroom (*Cordyceps militalis*) is still limited in terms of steps and time as well as the costs of cultivation. Therefore, the objective of this research was studied the suitable types of nitrogen sources such as silkworm, cricket and red palm weevil which supplemented with the culture medium. The result was found that the growth by fruiting body number and dry weight measurement when cultivating the mushrooms on silkworm will give the highest yield of mushrooms followed by red palm weevil and cricket, respectively. The growth of *Cordyceps militalis* cultivated with silkworm pupae gave the highest yield. The average number of fruiting body was 110.14 ± 5.46 flowers per bottle and the average dry weight was 3.50 ± 1.25 grams per bottle, followed red palm weevil. The average number of *C. militalis* was 98.65 ± 1.33 per bottle and the average dry weight was 0.95 ± 1.69 g per bottle. cricket yielded the lowest yield. The average number of *C. militalis* was 51.67 ± 0.33 flowers per bottle and the average dry weight was 0.43 ± 0.50 g per bottle. In addition, the formula containing potato extract water: Sangyod rice: silkworm pupae: yeast extract: peptone in the ratio of 30: 30: 20: 15: 15 ml/g/g/g/g. The highest bioactive substances which were analyzed by HPLC method with the average cordycepin content equal to $1,097.50 \pm 0.13$ mg/100 g. Moreover, we were not found *Escherichia coli*, *Salmonella* sp. and *Staphylococcus aureus* on dried Tung-chao mushroom powder.

Keywords: Cordycepin, *Cordyceps militalis*, Cricket, Red palm weevil, Silkworm

¹ Department of Applied Biology, Faculty of Sciences and Liberal Arts, Rajamangala University of Technology Isan

* Corresponding author email: wichudaklaweck@gmail.com

Comparative biological activities of Zingiberaceae plants harvested in Eastern Thailand

Sukanya Noramat^{1,2}, Chanitsara Thongmee^{1,2} and Klaokwan Srisook^{1,2,*}

Zingiberaceae, commonly known as the ginger family, is frequently utilized as a spice and traditional herbal medicine. The rhizomes of this family possess diverse range of biological activities. In this study, a comparative analysis was conducted to evaluate the bioactivity of six ginger plants, including rew-hom (*Etilingera pavieana* (Pierre ex Gagnep.) R.M.Sm.), ginger (*Zingiber officinale* Rosc), galangal (*Alpinia galangal* (L.) Willd), black galangale (*Kaempferia parviflora* Wall. ex Baker), fingerroot (*Boesenbergia rotunda* (Linn.) Mansf.), and turmeric (*Curcuma longa* L.), which were collected from the eastern region of Thailand. Anti-inflammatory activity was assessed by analyzing the inhibition effect of nitric oxide production in LPS-induced RAW 264.7 macrophages. Antioxidant activity was demonstrated using the DPPH radical scavenging and reducing capacity assay, and tyrosinase inhibitory activity was also tested. The results revealed that the ethanol extract of rew-hom rhizome had the highest tyrosinase inhibitory activity, followed by the extract from the turmeric rhizome. Conversely, the turmeric rhizome extract exhibited greater antioxidant activity than the rhizomes of rew-hom and other plants. The most effective anti-inflammatory extract was derived from the rhizome of galangal, followed by fingerroot, and turmeric. Overall, these findings suggest that these plants have significant bioactivity and may have potential for development into health food or cosmeceuticals products.

Keywords: Anti-inflammatory activity, Antioxidant activity, Anti-tyrosinase activity, Zingiberaceae

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Research Unit of Natural Bioactive Compounds for Healthcare Products Development and Center of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University

*Corresponding author email: klaokwan@go.buu.ac.th

**Study on microplastic in *Amphibalanus* sp., *Chthamalus* sp. and
Tetraclita sp. in Chonburi Province, Thailand**

Utumporn Sathapanaseth^{1,*}, Benny K.K. Chan² and Monthon Ganmanee¹

Microplastics (MP) are endangering the marine ecosystem increasing amounts. These microplastic particles can be harmful to marine life, risk to ingest these microplastic particles, particularly filter and suspension-feeding marine animals. One of the most abundant suspension feeder in intertidal communities are barnacles. Therefore, they can be used to study of MP trophic transfer in coastal ecosystem. On Sichang Island, the closet island from the mouth of Chao Phraya river, this study investigation aimed to evaluate the abundance, size and type of MP in three different zonation of acorn barnacles species: *Amphibalanus* sp. (mid shore), *Chthamalus* sp. (high shore) and *Tetraclita* sp. (low-mid shore). Results showed that *Amphibalanus* sp. had the highest abundance, with an average abundance of 0.63 ± 0.41 item/individual. MP Sizes ranged from 67.95 – 1699.49 μm . Most of MP size was less than 700 μm . The type of MP found in according to the finding barnacle include fiber and film and the most common type of polymer was polypropylene (45%). Abundance of MP in mid shore barnacle were statistically higher that high shore barnacle ($p < 0.05$).

Keywords: *Amphibalanus* sp., Barnacles, *Chthamalus* sp., Intertidal zone, Microplastics, *Tetraclita* sp.

¹ Aquacultural Technology and Aquatic Resource Management, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

² Biodiversity Research Center, Academia Sinica, Taipei 11529, Taiwan

* Corresponding author email: 64604038@kmitl.ac.th

Microplastic contamination in commercial bivalves from a seafood market in Eastern of Thailand

Ponrujee Yongsiri¹, Toemthip Poolpak¹, Somsak Panha²,
Maleeya Kruatrachue¹ and Ekgachai Jeratthitikul^{1,*}

Contamination of bivalves by microplastics (MP) is a potential route or their entry into humans. To assess the degree of contamination and potential risks of human exposure to MPs in Thailand, this study examined the abundance of MPs in three commercial bivalve species (green mussels *Perna viridis*, short-necked clams *Paphia undulata*, and cockles *Anadara granosa*) purchased from a local seafood market in Sattahip District, Chonburi Province, Thailand. Digestive organs were selected for MP investigation, and all examined bivalves were found to be contaminated with MPs. Although, there was no significant difference in MP abundance among the three species. Cockles showed the highest abundance (142.66 ± 62.35 items/g) followed by short-necked clams (72.83 ± 15.91), and green mussels (64.25 ± 12.46). Significant differences were detected among categories for shape and color of MPs found in bivalves, with the fragment as the predominant shape and transparent as the predominant color. Four types of plastic were identified using μ -FTIR, consisting of polypropylene (PP), polyester (PES), nylon, and plexar. The results further showed that secondary MP were the predominant types of MPs found in this study, and that the MP accumulations were correlated with bivalves' size and were affected by their habitat. The information obtained from this study can help to assess the risk of MP entry to humans and manage MP pollution in Thailand.

Keywords: Bivalve, Cockle, Green mussel, Microplastic contamination, Short-necked clam, Thailand

¹ Department of Biology, Faculty of Science, Mahidol University, Bangkok 10400

² Animal Systematics Research Unit, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330

* Corresponding author email: ekgachai.jer@mahidol.edu

Study on properties of natural water for ready biodegradability test according OECD 301F

Mirantee Deecharern¹, Jantana Panpran¹, Noppawan Srasaengta¹, Chanchai Kahapana¹,
Suttida Kongjay¹ and Anchana Pattanasupong^{1,*}

Properties study of three natural water resources in central of Thailand to be an inoculum for biodegradation testing according to OECD 301F standard test method. The three natural water resources selected for this study are the Chao Phraya River, Nonthaburi Province (A) Tha Chin River, Nakhon Pathom Province (B) and Mae Klong River, Ratchaburi Province (C). All three areas were collected in November 2022 will be used as inoculum for biodegradation testing, and the properties found to meet the criteria specified in the OECD 301F for use as inoculum. The biodegradation percentages of sodium benzoate as a positive reference compound were 83.13 – 95.52 % within 28 days. Retesting by collecting water samples in January 2023, it was found that the percentage of biodegradation at 85.01 – 96.85 within 28 days. Therefore, it can be mentioned that all 3 natural water sources were qualified to be used as inoculum for biodegradation testing according to OECD 301F. However, to assess the validity of the test method, the next study will expand the area of natural water sources collected for test inoculum verify the accuracy and reliability of the biodegradable properties of chemical products.

Keywords: Environmentally friendly products, OECD 301F, Ready biodegradability, Sodium benzoate

¹ Material Biodegradation Testing Laboratory, Material Properties Analysis and Development Centre,
Thailand Institute of Scientific and Technological Research, 35 Moo 3, Khlong 5, Khlong Luang, Pathumthani 12120

* Corresponding author email: anchana@tistr.or.th

Effects of Paclobutrazol on the growth of (*Thrixspermum* sp.) *in vitro*

M.Natthapitch¹, Y.Winitchaya¹, P.Kulwarin¹, L.Hathairat¹ and T.Thanyaporn^{1,2,*}

Thrixspermum sp. is a rare wild orchid in Thailand. There can be found only 6 species. This study was courtesy of the Khao Yai National Park, where provided *Thrixspermum* sp. The study aimed to preserve the original orchid species for a long time and without having to change medium periodically. Six-month-old *Thrixspermum* sp. capsules were cultured on Vacin and Went (VW) medium for 18 months, The plantlet 2 leaves and 1 rhizoid and height 1 cm were transferred into VW medium with Paclobutrazol in concentrations at 0, 0.25, 0.5, 1.0, and 2.0 mg/L for 6 months. The results showed that VW medium supplemented with PBZ 0.5 mg/L gave the highest of leaf number at 2.48 ± 0.13 leaves/plant. VW medium supplemented with PBZ 0.25 mg/L gave the highest of leaf length at 3.33 ± 0.16 cm./plant. VW medium without PBZ gave the highest root number 4.87 ± 0.30 roots/plants. VW medium supplemented with PBZ 0.5mg/L gave the highest of root at 2.22 ± 0.16 cm./plant. VW medium without PBZ gave the highest height of 2.98 ± 0.31 cm./plant. Which has no significant statistical difference of 0.05. This study may benefit the conservation of rare orchid species. It is an extension of the species and brought back to nature. In order not to lose it and to continue to maintain the species in the ecosystem system.

Keywords: Paclobutrazol, *Thrixspermum* sp., Tissue culture

¹ Demonstration School University of Phayao, Phayao, Thailand

² School of Science University of Phayao, Phayao, Thailand

* Corresponding author email: thanyaporn.bo@up.ac.th

The effect of 6-benzylaminopurine and thidiazuron on *in vitro* propagation of *Kalanchoe beharensis* Drake

Airada Khinghom¹ and Wittaya Pakum^{1,*}

Kalanchoe beharensis Drake, a succulent plant in the Crassulaceae family, is commonly grown as an ornamental plant. Plant propagation via seeds sowing and stem cuttings were not enough for market demand. In this study, the optimal *in vitro* propagation methods of *K. beharensis* were screened. The aim of this study was to examine the effect of plant growth regulators (PGR) on explants regeneration. Leaves and shoots were used as explant material. The sterilized explants were cultured on Murashige and Skoog medium (MS) supplemented with varied concentrations and PGRs. To screen the optimum condition of explants and PGRs, both 6-benzylaminopurine (BAP) and thidiazuron (TDZ) were used at the concentration of 0, 0.1, and 0.5 mg·L⁻¹. After culturing for 8 weeks, MS supplemented with 0.1 mg·L⁻¹ BAP was the optimum condition that could induce 3.5 shoots and 2.4 roots per explant. Higher concentration of BAP trended to decrease the number of shoot and root induction on both leaves and shoot explants. The use of TDZ had a greater impact on the induction of callus than shoots and roots formation. The results demonstrated an optimal method for *in vitro* propagation of *K. beharensis* using MS medium supplemented with BAP.

Keywords: Cytokinins, Elephant ear kalanchoe, *In vitro* propagation

¹ Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok, 10110

* Corresponding author email: wittayap@g.swu.ac.th

Study on suitable treatment containing 2,4-dichlorophenoxyacetic acid on callus induction from PSL-92147-1-2-4 and Leum Pua Glutinous Rice

Chutima Hongcharoenthai¹, Satachanakamon Sankhaphong¹ and Sarassawadee Pookorn^{1,*}

This research aimed to find out suitable medium containing suitable concentration of 2,4-dichlorophenoxyacetic acid on callus induction from PSL-92147-1-2-4 and Leum Pua Glutinous Rice. The research studied on rice seeds that were cultured on MS (Murashige and Skoog, 1962) medium, supplemented with 2,4-dichlorophenoxyacetic acid at the concentrations of 0.5, 1, 1.5, 2, 2.5 and 3 mg/L, for 4 weeks. Results showed that treatment contained 2,4-dichlorophenoxyacetic acid at the concentrations of 2.5 mg/L gave the highest percentage of Leum Pua Glutinous Rice callus induction, 60%, with 0.144 g fresh weight. In PSL-92147-1-2-4 callus induction, callus couldn't grow in any treatments.

Keywords: 2,4-dichlorophenoxyacetic acid, Callus, MS medium, Rice

¹Naresuan University Secondary Demonstration School, Faculty of Education, Naresuan University, Phitsanulok, 65000

*Corresponding author email: sarassawadeep@nu.ac.th.

Ecology distribution and conservation status of wild orchid of *Pleione* genus in Thailand

Nirunrut Pomoim^{1,*}, Supattra Limpiyaprapan¹, Natthakiat phadungkamol¹,
Thanakorn Kheunsen¹ and Khuansupa Srisombat¹

Pleione is one of rare and endangered groups of the Orchid family. In the worldwide, there are about 25 species. In Thailand have reported 3 species were *Pleione praecox*, *Pleione maculata* and *Pleione humilis*. This research has selected the geographic information system and spatial distribution modelling with Maxent based on Maximum entropy approach to predict extent of occurrence that relationship with ecological to provide information for assess conservation status and measures to protect this *Pleione* genus from extinction from Thailand. The results by Maxent model revealed that *Pleione praecox* were found in evergreen forest at 1,500-2,500 m of elevation above mean sea level. Annual mean temperature were 14-20 °C, of which mean temperature of coldest quarter and driest quarter were 12-16 °C. *Pleione maculata* were distributed in stone, grassland and hill evergreen forest at 1,400-2,000 m of elevation, Mean temperature of warmest quarter between 20-23 °C, Mean temperature of driest quarter between 14-17 °C and Annual precipitation between 500-1,000 mm. *Pleione humilis* have distributed only one population in hill evergreen forest at elevation higher than 2,300 m. The highest percentage of contribution was mean temperature of wettest quarter was 14-18 °C and Mean temperature of driest and coldest quarter was not more than 13 °C. Moreover, the extent of occurrence of *Pleione praecox* have covered approximately 1,419 km² with prediction overall accuracy of 98% and extent of occurrence of *Pleione maculata* covered 568 km² with prediction overall accuracy of 97%. Meanwhile, *Pleione humilis* have extent of occurrence covered only 9 km² with prediction overall accuracy of 99%. Based on in the areas of extent of occurrence, the conservation status of *Pleione praecox* and *Pleione maculata* are categorized as Endangered status and *Pleione humilis* are categorized as Critically Endangered by Criterion B1(a)(b)(i) of IUCN red List.

Keywords: Conservation status, Distribution, Ecology, *Pleione* Genus

¹ Forest Genetics and Rare Wild Plant Species Research Group, Forest and Plant conservation research office, Department of National parks, wildlife and Plant conservation

* Corresponding author email: kekek_r@hotmail.com

Analysis of expression patterns of Brassinosteroid-responsive genes in *Arabidopsis* root using single-cell RNA sequencing dataset

Thanaporn Wongkham¹, Juthamas Chaiwanon^{2,*} and Sira Sriswasdi³

Brassinosteroid (BR) plays a complex role in root growth and development by regulating the expression of downstream target genes through the BR signaling pathway. In this study, the scRNA-seq data of *Arabidopsis* roots revealed tissue- and developmental-specific roles of BR in *Arabidopsis* root development. Atrichoblast, an epidermal cell that develops into a non-hair cell, displayed the highest enrichment of BR-induced genes in the elongation and maturation zones among all cell types. Trajectory analysis showed that BR biosynthesis gene expression are varied by cell types. During elongation and maturation stages, the expression levels of BR biosynthesis genes (*DET2* and *ROT3*) and BR signaling genes (*BRI1* and *BSK1*) were higher in atrichoblast than in trichoblast. This finding may provide evidence that the larger percentages of BR-induced gene expression in the atrichoblast were related to the higher levels of BR and BR signaling activity in this cell type.

Keywords: *Arabidopsis*, Brassinosteroid, Epidermis, Root Development, Single Cell RNA-Seq

¹ Inter-Department of Bioinformatics and Computational Biology, Graduate School, Chulalongkorn University

² Center of Excellence in Environment and Plant Physiology, Department of Botany, Faculty of Science, Chulalongkorn University

³ Research Affairs, Faculty of Medicine, Chulalongkorn University

* Corresponding author email: juthamas.c@chula.ac.th

SiRNA-mediated knockdown against PD-L1 suppresses cell proliferation and influences apoptosis in MDA-MB-231 cells

Diomerl Edward Baldo^{1,#}, Phichamon Phetchahwang^{2,#}, Photsathorn Mutapat²,
Jisnuson Svasti² and Voraratt Champattanachai^{2,*}

Triple-negative breast cancer (TNBC) is an aggressive type of cancer characterized by faster growth rate and higher risk of metastasis. Several types of cancer display a high expression of programmed death-ligand 1 (PD-L1), which binds to programmed cell death protein (PD-1) on immune cells, allowing tumor cells to avoid immune destruction. Here, we demonstrated that MDA-MB-231, a TNBC representative, has a high level of PD-L1. Thus, this study aims to investigate the effects of PD-L1 knockdown using small interfering RNA (si-RNA). PD-L1 knockdown caused a decrease in cell viability at the first 24 hours until 48 hours of post transfection. However, there was no change in cell cycle arrest detected by Muse Cell Cycle Assay. Interestingly, si-PD-L1 treated cells showed an increase apoptosis, down-regulated expression of Bcl-2, an anti-apoptotic protein, and up-regulated expression of BAX, a pro-apoptotic protein compared to the si-Scrambled control cells. Moreover, when co-cultured with activated Jurkat T-cells expressing a high level of PD-1, apoptotic cells of si-PD-L1 treated MDA-MB-231 were increased, in contrast to the control group. These results indicate that the reduced level of PD-L1 may enhance and regain the anti-tumor functions of T-cells. Overall, our preliminary results illustrate that PD-L1 present in MDA-MB-231 may be required for tumor progression, and the reduction in PD-L1 level induces apoptosis both in the single culture and co-culture with activated Jurkat T-cells. PD-L1 may serve as a novel therapeutic target for TNBC.

Keywords: Breast cancer, Immunotherapy, Programmed death ligand 1 (PD-L1), siRNA, Triple-negative breast cancer

¹ Applied Biological Sciences Program, Chulabhorn Graduate Institute, Chulabhorn Royal Academy, Bangkok, 10210

² Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok, 10210

Authors have equally contributed to this work.

* Corresponding author email: voraratt@cri.or.th

Content validity of the brief International Classification of Functioning, disability and health (ICF) core set for children and youth with cerebral palsy (Thai Version)

Areerat Tatongjai^{1,2}, Sattragorn Sudhanyaratana¹, Thitirat Paisart¹, Pismai Malila^{1,2}
and Punnee Peungsuwan^{1,2,*}

The objective of this study was to evaluate the content validity of the brief ICF core set for children and youth with cerebral palsy using the Thai version. The brief ICF core set consisted of two forms for children, 6–13 years (35 categories), and youth, 14–18 years (37 categories), based on Schiariti and colleague study. Five professional physical therapists who have experienced more than ten years in the intervention in patients with cerebral palsy. Content validity of the brief ICF core set was examined using the content validity index (CVI), scale-level CVI/universal agreement (S-CVI/UA) and scale-level CVI/average agreement (S-CVI/Ave). The results showed the CVI, S-CVI/UA and S-CVI/Ave were high values of 0.8–1, 0.90 and 0.91, respectively. The brief ICF core set for children and youth with cerebral palsy (Thai version) is a content-valid instrument for assessing comprehensive problems in the functioning of patients with CP, which can be used to design and evaluate rehabilitation strategies.

Keywords: Children with cerebral palsy, Content validity, ICF core set

¹ School of Physical Therapy, Faculty of Associated Medical Sciences, Khon Kaen University, Muang, Khon Kaen 40002, Thailand

² Research Center in Back, Neck, Other Joint Pain and Human Performance (BNOJPH), Faculty of Associated Medical Sciences, Khon Kaen University, Khon Kaen 40002, Thailand

* Corresponding author email: ppunne@kku.ac.th

Factors associated with poor glyceimic control among Akha patients with type 2 diabetes mellitus, Chiang Rai, Thailand: a hospital-based case-control study

Fartima Yeemard^{1,*}, Assoc. Prof. Dr. Wisit Chaveepojnkamjorn¹,
Asst. Prof. Dr. Sukhontha Siri¹ and Asst. Prof. Dr. Tawatchai Apidechkul²

A Hospital-based case-control study purpose of this study was to study factors related to poor glyceimic control among type 2 diabetic patients, hill tribes, Akha tribes, Chiang Rai province. They were divided into the study group whose final blood glucose HbA1c was greater than or equal to 7% and the control group had the last HbA1c blood glucose was less than 7% by means of interviews. Validated questionnaires Between March and April from the calculation of the sample group using the formula, 200 people were obtained, divided into a study group of 100 people and a control group of 100 people, and analyzed the data by descriptive statistics, Chi-square statistics, and logistic regression statistics. Were used to identify the associated with poor glyceimic control at the significance level $\alpha = 0.05$.

The results showed that Factors associated with poor glyceimic control among type 2 diabetic patients of Akha hill tribes Chiang Rai province, including female (Adjusted OR = 2.02; 95%CI = 1.14 - 3.57) exercise in sometime (Adjusted OR = 5.87; 95%CI = 2.71 – 12.68) and consumption of sticky rice (Adjusted OR = 6.37; 95%CI = 3.12 – 12.99)

The results of this study demonstrate Factors affecting poor glyceimic control of patients with type 2 diabetes mellitus in the study area Therefore, medical personnel and public health should pay attention to the factors that occur. taking into account gender with poor glyceimic control. In addition, exercise should be promoted in the patient group. and consumption of the type of rice eaten to increase the efficiency of treatment and control blood sugar levels in the future.

Keywords: POOR GLYCEMIC CONTROL AKHA PATIENTS WITH TYPE 2 DIABETES MELLITUS

¹ Department of Epidemiology Faculty of Public Health Mahidol University

² School of Health Sciences Mae Fah Luang University

* Corresponding author email: fartima.far052@gmail.com

Factors associated with type 2 diabetes mellitus among new cases in Damnoen Saduak Hospital, Ratchaburi Province

Patcharin Klatpan^{1,*}, Wisit Chaveepojnkamjorn¹ and Natnaree Aimyong¹

This study was a matched case-control study, conducted by matching sex, age, and domicile. Data were collected from the sample of clients in Damnoen saduak Hospital, Ratchaburi Province, divided into 206 patients with Type 2 Diabetes Mellitus diagnosed by a physician during 2015-2019 and 206 patients without Type 2 Diabetes Mellitus. A research instrument for data collection was a Interview form. Multiple logistic regression analysis was used to estimate odds ratios and 95% confidence intervals (CIs). The result revealed that excessive waist circumference (Men \geq 90 CM, Women \geq 80 CM)(OR = 2.38, 95%CI= 1.24-4.57, p=0.009), Family history of diabetes (OR = 5.28, 95%CI=2.99-9.35, p<0.001), Current smoker (OR = 4.34, 95%CI=1.58-11.91, p=0.004), Sodium consumption high risk (OR = 7.21, 95%CI=1.65-21.59, p=0.009) and Suspected of stress (OR = 2.35, 95%CI=1.22-10.95, p=0.012). In conclusion, people with excessive waist circumference, Family history of diabetes, Current smoker, Sodium consumption high risk and Suspected of stress. It is statistically significantly correlated with the occurrence of type 2 diabetes.

Keywords: Matched case-control, Ratchaburi Province, Type 2 Diabetes Mellitus

¹ Department of Epidemiology, Faculty of Public Health, Mahidol University, Bangkok, 10400

* Corresponding author email: Patcharin-mim@hotmail.com

Factors associated with hypertension among clients at Damnoen Saduak hospital, Ratchaburi Province

Pimpisut Thampipattanakul^{1,*}, Wisit Chaveepojnkamjorn² and Natnaree Aimyong³

The purpose of this research was to examine the factors associated with the hypertension among the clients at Damnoen Saduak hospital, Ratchaburi province. This study use a hospital base case – control study. The research duration was between 2015 to 2019. The Case group consisted of patients who have been diagnosed with a physician as a new patients with hypertension during the study period. The control group consisted of patients with common diseases that have not been diagnosed with hypertension or various non-communicable diseases. The participants were divided into cases 271 patients and controls 271 patients, with matching factors: gender, age group and residence group. Data collected were then analyzed using descriptive and analytical statistics. The results showed that the factors associated with the hypertension were Metabolic Syndrome (OR = 1.93), Family history with Hypertension (OR = 5.00), Smoking behavior (OR = 3.96), Low level of physical activity (OR = 0.33), Sedentary lifestyle (OR = 2.17), Sugar consumption behavior (OR = 5.28) and Sodium consumption behavior (OR = 9.98). The correlation was statistically significant at 0.05.

Keywords: Damnoen Saduak hospital, Hypertension, Ratchaburi Province

¹ Department of Epidemiology, Faculty of Public Health, Mahidol University, Bangkok 10400, Thailand.

² Assoc. Prof., Department of Epidemiology, Faculty of Public Health, Mahidol University, Bangkok 10400, Thailand.

³ Asst. Prof., Department of Epidemiology, Faculty of Public Health, Mahidol University, Bangkok 10400, Thailand.

* Corresponding author email: ppimm1598@hotmail.com

Dentist's assessment of oral status, denture quality, oral health related quality of life, and their associations: a cross-sectional study in tooth-supported removable partial denture wearers

Manoonya Autchariyaphun^{1,*}, Wacharasak Tumrasvin¹ and Nareudee Limpuangthip¹

Success of removable partial denture treatment consisted of clinical assessment by dentist and patient-reported outcome. This study aims to identify patient's factors and denture quality associated with oral health-related quality of life (OHRQoL) of tooth-supported metal-based removable partial denture (MRPD). Fifty tooth-supported MRPDs patients were oral examined to collect dental status and denture quality by dentist. OHRQoL was interviewed using the Thai-version of 14-item oral health impact profile (OHIP-14). Differences in OHIP-14 between variables were analyzed using Mann-Whitney U test or Kruskal Wallis test. The results showed statistically significant higher OHIP14-score in patients with less than 4 posterior occluding pairs, poor non-abutment tooth, poor denture quality that were metal framework distortion and denture instability, while other problems showed no significant difference of OHIP-14 score. In conclusion, tooth-supported MRPDs' patients with impaired denture quality and poor dental status rarely reported impaired OHRQoL. Dentists and patients should be aware of underlying problems and increase awareness of having routine dental and denture check-up.

Keywords: Denture quality, Oral health-related quality of life, Removable partial denture

¹ Department of Prosthodontics, Faculty of Dentistry, Chulalongkorn University, Bangkok, 10330

* Corresponding author email: manoonya.a@gmail.com

Comparative analysis of lifestyle and physical activity among medical and health sciences students in Vietnam during and after the COVID-19 pandemic

Tam Ho^{1*}, Sirichai Adisakwattana¹, Charoonsri Chusak¹ and Nguyen Thuy Linh^{2,3}

This study aimed to investigate the impact of the COVID-19 pandemic on the lifestyle and physical activity of medical and health sciences students in Vietnam. A cross-sectional online survey was conducted with 512 students at Hanoi Medical University between August and September 2022. The results showed that, compared to the pandemic period, there was a significant decrease in both screen time and sleep duration in the post-pandemic era. However, the frequency of skipping breakfast significantly increased after the pandemic ($p < 0.001$). Furthermore, there was a significant improvement in the overall physical activity level of students in the new normal. These findings highlight the disruptive effect of the pandemic on the lifestyles of medical and health sciences students in Vietnam, and the need for interventions to promote healthy behaviors among this population.

Keywords: Lifestyle and Physical Activity, COVID-19 Pandemic, Vietnam

¹ Phytochemical and Functional Food Research Unit for Clinical Nutrition, Department of Nutrition and Dietetics, Faculty of Allied Health Science, Chulalongkorn University, Bangkok 10330, Thailand

² School for Preventive Medicine and Public Health, Hanoi Medical University, Hanoi, Vietnam

³ Department of Nutrition and Dietetics, Hanoi Medical University Hospital, Hanoi, Vietnam

* Corresponding author email: thanhtam197.hmu@gmail.com

Antimicrobial effect of locally produced silver diamine fluoride

Suphanida Kaewkamchai^{1,*}, Waleerat Sukarawan¹, Panida Thanyasrisung²
and Siriporn Songsiripradubboon¹

The purpose of this study was to evaluate the chemical properties and the antimicrobial activity of the locally produced silver diamine fluoride compared to two commercial products of 38% silver diamine fluoride, Saforide[®] and Topamine[™]. This study consists of three parts: 1) Measurement of pH, 2) Measurement of fluoride ions and silver ions and 3) Determination of the antimicrobial activity by the disk diffusion method against *Streptococcus mutans* UA159 and *Candida albicans* SC5341 in three repeated independent experiments. The average zone of inhibition between the groups was analyzed using the Kruskal-Wallis test. The significance level was set at $p=0.05$. The locally produced silver diamine fluoride had pH values of 9.0 ± 0.12 . The average fluoride and silver ion concentrations in our products were $64,076.67 \pm 623.33$ ppm and $124,600.00 \pm 200.00$ ppm, respectively. This study showed that the locally produced silver diamine fluoride and two commercial products had no statistically significant antimicrobial activity against *Streptococcus mutans* and *Candida albicans*, the zone of inhibition of the locally produced silver diamine fluoride, Saforide[®] and Topamine[™] against *Streptococcus mutans* were 15.11 ± 1.15 , 14.83 ± 0.29 and 14.81 ± 0.59 mm, respectively. The zone of inhibition against *Candida albicans* were 13.33 ± 0.46 , 14.67 ± 0.29 and 14.08 ± 0.82 mm, respectively. In conclusion, the locally produced silver diamine fluoride had comparable pH value, fluoride, and silver ion concentrations to commercially available silver diamine fluoride and demonstrated no difference in the *in vitro* antimicrobial activity from commercially available silver diamine fluoride.

Keywords: Antimicrobial activity, *Candida albicans*, Silver Diamine Fluoride, *Streptococcus mutans*

¹ Department of Pediatric Dentistry, Faculty of Dentistry, Chulalongkorn University

² Department of Microbiology and Center of Excellence on Oral Microbiology and Immunology, Faculty of Dentistry, Chulalongkorn University

* Corresponding author email: suphanida.kaew2002@gmail.com

Enhancing bio-electricity generation from the palm oil mill effluent in microbial fuel cell coupled with bilirubin oxidase producing bacteria

Junijira Thipraksa¹, Panisa Michu² and Pimprapa Chaijak^{3,4,*}

The microbial fuel cell (MFC) is the device that converts chemical energy to bio-electrical energy through microbial metabolism. It has been found to be used for wastewater treatment and simultaneously powers generation. In the work, the oxidoreductase-producing bacteria *Bacillus* sp. MCO22 was used for the MFC biocathode construction when the rice straw was used as a low-cost substrate. The palm oil mill effluent (POME) was applied into the anodic chamber as a chemical energy source for electricity generation. The BOD activity and electrochemical properties have been monitored during the operation. The chemical oxygen demand (COD) and the color removal have been measured after the operation. The results indicated that the MFC with the BOD-based cathode can produce the maximal current density and power density of 0.58 ± 0.01 A/m² and 0.17 ± 0.00 W/m² respectively. The COD and color removal of $95.10 \pm 0.10\%$ and $98.53 \pm 0.33\%$ were achieved without a power supply. This study gained new knowledge in using the BOD-producing bacteria as a whole-cell biocatalyst on the MFC cathodic surface for electricity generation and agricultural wastewater treatment.

Keywords: Bilirubin oxidase, Bioenergy, Electricity generation, Microbial fuel cell, Palm oil mill effluent

¹ Department of Biology, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand

² Department of Biotechnology, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand

³ Microbial Fuel Cell & Bioremediation Laboratory, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand

⁴ Microbial Technology for Agriculture, Food and Environment Research Center, Phatthalung 93210, Thaksin University, Thailand

Screening of phylloplane bacteria for controlling *Xanthomonas oryzae* pv. *oryzae*

Aphichaya Sangkaew¹, Tantara Treesuttacheep² and Juangjun Jumpathong^{3,*}

The objective of this study was to identify bacteria from the phyllospheric zone that inhibited the growth of *Xanthomonas oryzae* pv. *oryzae* (*Xoo*), the pathogen causing bacterial leaf blight on rice crop. The leave samples were isolated for phylloplane bacteria colony and observed for the morphology on agar. In this study, thirteen bacterial isolates were screened for antibacterial activity using paper disc diffusion method. The lipopeptide crude extract was prepared. The isolate N10-09 and N10-05 had good activity against *Xoo*. The diameter of the inhibitory zones was 31.15 ± 0.76 and 21.53 ± 8.52 mm, respectively. This indicated highly effective antibacterial activity. Analysis of 16S rRNA genes provided that isolate N10-09 and N10-05 belonged to the genus *Bacillus*. The LC-ESI-MS/MS analysis of crude extract from N10-09 enabled the identification of surfactin A when compared with standard surfactin A. In conclusion, *Bacillus* sp. N10-09 and N10-05 were identified as *Bacillus* spp. The crude extract of N10-09 and N10-05 was capable of producing surfactin A that inhibits the growth of *Xanthomonas oryzae* pv. *oryzae* the most effectively.

Keywords: *Bacillus*, Bacterial leaf blight disease, LC-ESI-MS, Phylloplane bacteria, *Xanthomonas oryzae* pv. *oryzae*

¹ Naresuan University Secondary Demonstration School, Faculty of Education, Naresuan University, Phitsanulok, 65000

² Naresuan University Secondary Demonstration School, Faculty of Education, Naresuan University, Phitsanulok, 65000

³ Faculty of Agriculture, Natural Resources and Environment, Naresuan University, Phitsanulok, 65000

* Corresponding author email: juangjunj@nu.ac.th

The growth rate of thermotolerant yeast under multi-stress factors

Napath Pakdeewong^{1,*} and Sirijit Janpon¹

The bioethanol is regarded as one of the most important industries in Thailand. Ethanol production was obtained by fermentation of yeast derived from agricultural biomass. In the process of yeast fermentation, the stress factors such as heat and ethanol concentration affect to the growth ability of yeast cell, In this study the yeast *Pichia kudriavzevii* were characterized for growth performance under stress conditions of high temperature and ethanol concentration. Five thermotolerant yeasts *Pichia kudriavzevii*(NUPHS33, NUPHS34, NUNS-4, NUNS-5 and NUNS-6) were compared with one reference yeast strain *Saccharomyces cerevisiae* TISTR5606. Firstly, the growth capacity of thermotolerant yeast strains under heat factors (30 °C, 40 °C, 42 °C and 45 °C) and ethanol concentration (0%, 7% and 13%) was investigated by streak plate method. The results showed that three yeast strains, NUPHS33, NUPHS34 and NUNS-6, well grew under multi-stress factors. Further, the growth rates of six yeast strains including, *P.kudriavzevii* NUPHS33, NUPHS34, NUNS-4, NUNS-5 and NUNS-6 were studied by specific growth rate assay under high temperature and ethanol concentration. The specific growth rate of *P.kudriavzevii* NUPHS33 showed the highest value of 0.23 ± 0.00 (30°C, 0% ethanol), 0.19 ± 0.01 (40°C, 0% ethanol) and 0.08 ± 0.03 h⁻¹ (40°C, 7% ethanol), respectively when compared to the other isolates. Therefore, This suggests that *P.kudriavzevii* NUPHS33 was the most efficient isolate to tolerate under stress of high temperature and ethanol concentration.

Keywords: Ethanol, High-temperature, *Pichia kudriavzevii*, Specific growth rate, Thermotolerant yeast

¹ Naresuan University Secondary Demonstration School, Naresuan University, Phitsanulok, 65000

* Corresponding author email: napathp64@nu.ac.th

Effects of nitrogen and carbon sources on the inulinase production from strain *Penicillium citrinum* IS13

Manassanun Kanthatsakul¹, Rawisara Ruenwai¹ and Supaporn Passorn^{1,*}

Nowadays, the inulinase enzyme is becoming popular in the industry because it can be applied in a variety of ways. In the production process, the cost of the substrate to produce enzymes is also a major factor in the production process. Purified Inulin is a suitable substrate for enzyme production, but its price remains high. The purpose of this research was to investigate the effects of carbon and nitrogen sources on inulinase production from *Penicillium citrinum* IS13. It was found that pH, carbon and nitrogen sources in the culture medium affected cell growth and inulinase production. *P. citrinum* IS13 was able to grow and produce the highest inulinase enzyme at pH 5.5 by using inulin extracted from garlic pulp as a carbon source, about 12.68±0.190 U/ml. Moreover, Basal Medium formula adding ammonium sulfate as nitrogen source, obtained the highest enzyme activity at 7.090±0.070 U/ml.

Keywords: Inulinase, Inulin, *Penicillium citrinum* IS13

¹ Biotechnology, School of Agriculture and Natural Resources, University of Phayao, Phayao, 56000

* Corresponding author email: ppapon@hotmail.com

Antibacterial and anticancer activities of 3,4-dihydrolactucin isolated from *Microbispora* sp. AL22

Thongchai Taechowisan^{1,*}, Thanaporn Chuen-Im¹ and Waya S. Phutdhawong²

The AL22 strain was isolated from the rhizosphere soil of *Alpinia galanga* (L.) Willd (Zingiberaceae) and identified as *Microbispora* sp. by analysing its morphology, chemotaxonomy, and 16S rDNA sequence. Previous studies demonstrated the bactericidal effects of its crude extract against *Bacillus cereus*, *Bacillus subtilis*, *Staphylococcus aureus*, and methicillin-resistant *Staphylococcus aureus*. The present study aim to isolate the major compounds and evaluate their biological properties. Silica gel-column chromatography and thin-layer chromatography were used to purify and identify 3,4-dihydrolactucin (compound 1) and umbelliferone (compound 2) by NMR and mass spectrometry, respectively. Antibacterial and anticancer activities were carried out. The bioassay studies illustrated that compound 1 had antibacterial activity against Gram-positive bacteria; *B. cereus*, *B. subtilis*, *S. aureus*, and MRSA with its minimum inhibitory concentration and minimum bactericidal concentration of 16–32 µg/ml and 64–128 µg/ml, respectively. The crude extract and purified compounds showed weak cytotoxic activity on the L929 and Vero cells with IC₅₀ values >512.00 µg/ml. The cytotoxicity of compound 1 was observed in the MDA-MB-231 and HeLa cells with IC₅₀ values of 37.62 and 75.34 µg/ml, respectively, while its IC₅₀ value against the HepG2 cells was 456.67 µg/ml. These findings showed that compound 1 of *Microbispora* sp. AL22 exhibited antibacterial and anticancer activities. Extensive studies on 3,4-dihydrolactucin could lead to the development of beneficial approaches for managing bacterial infections and cancer.

Keywords: 3,4-dihydrolactucin, *Alpinia galanga*, Antibacterial activity, Anticancer activity, *Microbispora* sp.

¹ Department of Microbiology, Faculty of Science, Silpakorn University, Nakhon Pathom, 73000

² Department of Chemistry, Faculty of Science, Silpakorn University, Nakhon Pathom, 73000

* Corresponding author email: tewson84@hotmail.com

Development of anti-aging serum from corn extract

Peeraya Nimnuan¹, Pakjira Tongsut^{1,*}, Ajima Muangchuen¹ and Jirasit Inthorn²

As we age, our skin undergoes changes that can result in various issues, such as wrinkles, dark spots, blemishes, and freckles. Therefore, using skincare products is a vital means of revitalizing and maintaining healthy skin. Furthermore, skincare has become more accessible to everyone, including those with limited budgets, thanks to the use of natural extracts as the primary ingredient in innovative products. This research project aims to study skincare products containing corn extract, given that corn is a significant cash crop in Thailand and readily available in the market. The study will focus on two types of corn, namely sweet corn and waxy corn, as potential sources of skincare compounds. After investigating both of them by ethanol extraction, found that waxy corn contains more phenolic compounds than sweet corn. Therefore, the study will be centered on waxy corn only. The research tested three serum formulas with varying emulsifier levels to evaluate their stability, efficacy, and customer satisfaction. The emulsifiers used in this study are Lexemul 561 and Stearyl alcohol. The results revealed that the serum stability depends on the emulsifier level, and the medium level of emulsifier content is given the highest level of customer satisfaction.

Keywords: Emulsifier, Extract, Phenolic, Serum

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

² Faculty of Food and Agricultural Technology, Pibulsongkram Rajabhat University, Phitsanulok, 65000

* Corresponding author email: pakjirat65@nu.ac.th

Physiologically based pharmacokinetic / pharmacodynamic modeling of ketamine in humans

Nichikarn Diewsurin¹, Paepilai Panyatipsakul¹ and Manupat Lohitnavy^{2,*}

Ketamine is a psychoactive substance that can reduce the symptoms of depression. However, taking too much ketamine can result in side effects. Recently, a physiologically based pharmacokinetic (PBPK) model of ketamine was developed. Based on the existing model, we aimed to expand the capability of the model to predict the Montgomery-Asberg Depression Rating Scale (MADRS) as a result of oral ketamine administration in depression patients. The PBPK model was modified as follows: 1) Adding norketamine to first-pass metabolism 2) adding a pharmacodynamic (PD) compartment extending from the blood compartment. In PBPK model validation, the PubMed database was searched for reports of oral ketamine plasma concentration-time, and 1 article was identified. To describe pharmacodynamics of ketamine corresponding to ketamine blood concentration level, a turnover model was employed. The PubMed database was searched for reports of humans receiving ketamine and determining the depression effect, and 2 articles were identified. The developed PBPK/PD model resulted in a good agreement between the predicted and observed MADRS scores across several studies with an R-square value of 0.98 and 0.99 although after 72 hours of oral ketamine administration, simulation results underpredicted experimental data from the selected studies. A PBPK/PD model of ketamine could describe the depression effect over time profiles in humans receiving oral ketamine administration. The developed PBPK/PD model would be useful for ketamine dose prediction with fewer side effects and may lead to a safer use of depression treatment.

Keywords: Depression, Ketamine, Pharmacodynamic, Pharmacokinetic

¹ Naresuan University Secondary Demonstration School, Faculty of Education, Naresuan University, Phitsanulok, 65000

² Center of Excellence for Environmental Health and Toxicology, Faculty of Pharmaceutical Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: manupatl@nu.ac.th

Application of advanced mass spectrometry-based proteomics to identify and quantify plasma proteins of patients with colorectal cancer

Voraratt Champattanachai^{1,*}, Chris Verathamjamras¹, Juthamard Chantaraamporn¹, Thiwaree Sornprachum¹, Photsathorn Mutapat¹, Daranee Chokchaichamnankit¹, Somchai Chutipongtanate², Chantragan Srisomsap¹ and Jisnuson Svasti¹

Colorectal cancer (CRC) is a major cause of cancer mortality. Currently, blood-based CRC biomarkers provide insufficient sensitivity and specificity. This study aims to seek candidate biomarkers for CRC screening by using mass spectrometry-based proteomics. Label-free quantitative proteomics were used to identify and compare plasma proteins of patients with non-metastatic (NM) and metastatic (M) CRC and age-matched healthy controls. All plasma samples of each group were pooled and subjected to Multiple Affinity Removal System (MARS)-14 immunoaffinity chromatography in order to obtain 14 high- and low-abundant proteins prior to injection into a liquid chromatography tandem mass spectrometry (LC-MS/MS). We found that the levels of leucine-rich alpha-2-glycoprotein-1 (LRG), complement component C9 (C9), alpha-1-acid glycoprotein 1 (AGP1), and alpha-1-antitrypsin (A1AT) were increased, while fibronectin (FN) level was decreased in CRC patients compared to healthy controls, with most alterations being found in a metastatic stage-dependent manner. Validation was performed by immunoblotting in individual samples from two independent cohorts. Statistical analysis revealed that FN exhibited the best diagnostic performance to discriminate CRC patients from healthy controls, while AGP1 showed the best discrimination between the disease stages in two independent cohorts. The combined biomarker candidates, FN+A1AT+AGP1, exhibited perfect discriminatory power to discriminate between the CRC population and healthy controls whereas LRG+A1AT+AGP1 was likely to be the best panel to discriminate the metastatic stages. Collectively, this study provided distinct plasma proteome profiles of CRC patients. Our results suggest CRC biomarker candidates which may be further applied for screening in larger cohorts. Supported by TSRI, CRI (Grant No. 36821/4274352).

Keywords: Affinity chromatography, Blood-based biomarkers, Colorectal cancer, Label-free quantitative proteomics

¹ Laboratory of Biochemistry, Office of Research, Chulabhorn Research Institute, Bangkok, Thailand

² Department of Environmental and Public Health Sciences, College of Medicine, University of Cincinnati College of Medicine, Cincinnati, OH, USA

* Corresponding author email: voraratt@cri.or.th

Carbon accumulation in above ground biomass of tree in natural forest at Ban Romklao Botanical Garden Phitsanulok under the Royal Initiative

Natdanai Pan-in^{1,*}, Pranee Nangngam¹ and Charun Maknoi²

Studies on carbon accumulation in above ground biomass created a sample plot of 100 x 100 meters in the natural forest area of the Ban Romklao Botanical Garden Phitsanulok under the Royal Initiative of 2021. The study found that the type of natural forest is classified as a dry evergreen forest. A total of 496 tree individuals were found, with *Castanopsis acuminatissima* having the highest number of 81 individuals, followed by *Schima wallichii* and *Styrax benzoides* which found 41 and 39 individuals, respectively. Above ground biomass was 151.56 tons per hectare. The carbon accumulation in above-ground biomass was 71.23 tons of carbon per hectare and it was found that *C. acuminatissima* also had the highest carbon accumulation in above-ground biomass. The highest is 28.72 tons of carbon per hectare. The carbon dioxide absorption value was 261.21 tons of carbon dioxide per hectare, and the oxygen emission value was 189.98 tons of oxygen per hectare. From the research, it was found that trees with the circumference of the stem at breast level were large. The carbon accumulation value of above-ground biomass is higher than that of trees with small circumferences.

Keywords: Above ground biomass, Carbon accumulation, Romklao botanical garden, Tree

¹ Department of Biology, Faculty of Science, Naresuan University, Phitsanulok 65000

² Ban romklao botanical garden, Phitsanulok, under the royal initiative, Phitsanulok 65170

* Corresponding author email: Natdanaip61@nu.ac.th

The study of the carbon footprint of an school case study of Phra Pariyattidhamma school, Nan Province

พัชรีย์ ชัดศิริ^{1,*}, วิลาวัณย์ ภมรสุวรรณ¹ และวนิดา ชูอักษร¹

This research objectived to study the Carbon Footprint of Phrapariyattidhamma Secondary school, Nan province : Phrapariyattidhammanusorn Wat Fahsawan school and Phrapariyuttidham Wat Prang school, which were small schools. There were boarding house and official residences, 50 novices and 9 staff members attended the Phrapariyattidhammanusorn Wat Fahsawan school, compared to 94 novices and 16 staff members at the PhraPariyattidham Wat Prang school. The primary and secondary data were collected from May 2022 to March 2023 in accordance with the assessment of Thailand Greenhouse Gas Management Organization (Public organization: TGO). The results showed that Phrapariyattidhammanusorn Wat Fahsawan school released carbon dioxide gas was 18.83 tCO₂e per year (0.32 tCO₂e per person per year), the from utilizing vehicles and moving pupils was 37.98% of the emission, which whereas the total amount of emission from cooking gas 2.48 % of the emission. The Phrapariyattidham Wat Prang school produced 440.57 tCO₂e per year (4.14 tCO₂e per person per year), the water supply was used with 95.82% of the emission, which was 13 times greatre than Phrapariyattidham Wat Prang school and rubbish disposal with 0.12 % of the emission. Creating an action plan to reduce water supply usage, boost use of rainwater, water from natural rources, or water reuse was advised based on the main findings. It was also suggested that beginners and staff be taught how to conserve water effectively and appropriately.

Keywords: Carbon footprint, Greenhouse gas, Nan Province, Phrapariyattidham school

¹ Faculty of Science and Technology, Thammasat University, Khlong Luang District, Pathum Thani Province 12120
Thammasat University, Khlong Luang District, Pathum Thani Province 12120

* Corresponding author email: Patcharee.bou02@gmail.com

**Assessing the carbon footprint and creating guidelines to reduce greenhouse gas emissions of halal food products. Case study: Salted Gu Lao Fish Products
Kulao Thong Mae Pan Tak Bai**

Chonlada Kajaj¹ and Sukthai Pongpathanasiri^{2,*}

Carbon Footprint Assessment of Salted Kulao Fish Products Kulao Thong Mae Pan, Tak Bai, size 80g, assessed according to the requirements of the Thailand Greenhouse Gas Management Organization There is a Cradle to Gave or Business to Consumer (B2C) model for calculating greenhouse gas emissions throughout the life cycle of a product. which covers from the acquisition of raw materials production process Distribution, use and waste management as well as the transport involved in every step, calculated per functional unit of the product. The study found that salted kulao fish products Kulaothong brand, Mae Paen, Tak Bai, has greenhouse gas emissions of 0.48 kgCO₂e. Considering each process, it was found that the process that emitted the most greenhouse gases was acquisition of raw materials In this process, greenhouse gas emissions were up to 0.44 kgCO₂e or 92.43%, and followed by the production process which emitted greenhouse gases of 0.04 kgCO₂e. or 7.49%. In reducing the greenhouse gas emissions of this product, the researcher suggests that unused fish filaments be used for composting in order to further assess the reduction of greenhouse gas emissions.

Keywords: Carbon footprint product, Eco label, Halal food, Salted kulao fish

¹ Technology and Environmental Management Faculty of Energy and Environment University of Phayao

² Lecturer in Environmental Science Faculty of Energy and Environment University of Phayao

* Corresponding author email: sukthai_p@hotmail.com

The value-added products and the assessment of carbon footprint and cost of production from ginger residue

Potsanon Khankaew¹, Thanamas Srichaijaroenwong¹ and Suchada Ukaew^{2,*}

The objective of this research was to produce the value-added products from ginger residue left over from processing of ready-to-drink ginger powder. There value-added products were ginger essential oil and ginger scrub cream. In addition, the carbon footprint (CF) and cost of production were evaluated. The water distillation method was extracted ginger essential oil, in which the amount of ginger residue were carried out at the temperature of 120 °C with distilled water of 600 ml. From the result, 200 g of ginger residue product the maximum amount of essential oil. The CF of the value-added products were evaluated under the system boundary of cradle to grave starting from raw materials acquisition, production and packing, transportation, usage, and waste disposal. The ginger essential oil of 5 ml had the CF of 38.66 kg CO₂ eq. The ginger scrub cream of 250 g had the CF of 3.19 kg CO₂ eq. The production cost of the value-added products were evaluated under the system boundary of “cradle to gate” starting from raw materials acquisition, production, and packing. The production cost of ginger essential oil was 437.24 baht/package (5 ml). The production cost of ginger scrub cream was 143.10 baht/package (250 g).

Keywords: Cost of production, Ginger residue, Greenhouse gas emissions, Value-added product

¹ Naresuan University Secondary Demonstration School, Faculty of Education, Naresuan University, Phitsanulok, 65000

² Faculty of Engineering, Naresuan University, Phitsanulok, 65000

* Corresponding author email: suchadau@nu.ac.th

A study on ways to reduce greenhouse gas emissions from the production of halal food products in Pattani Province with the low emission support scheme (LESS)

Pattarawadee Wangsang^{1,*} and Sukthai Pongpattanasiri¹

This research aimed to study the reduction of greenhouse gases from activities in the workplace through the Low Emission Support Scheme (LESS) mechanism of the Thailand Greenhouse Gas Management Organization. (Public Organization) by 2 establishments: Pattani Vocational Kitchen and Mae Luan. There is an operational procedure for studying the data and collecting data for use in the research. Calculate the amount of greenhouse gas reduction from the waste management document by separating waste for recycling. Moreover, energy by changing lighting equipment to increase efficiency. The results showed that Pattani vocational kitchen in waste management by separating waste for recycling has a reduction in greenhouse gas emissions equal to 1,039 kilograms of carbon dioxide equivalent. Furthermore, the Mae Luan uses energy by changing lighting equipment to increase efficiency. There is a reduction in greenhouse gas emissions equal to 126 kilograms of carbon dioxide equivalent. Therefore, the activities at Pattani Vocational Kitchen and Mae Luan have been implemented concretely. Reduce greenhouse gas emissions from the LESS project and participate in social and environmental responsibility. Activities to reduce greenhouse gas emissions also helps restore and maintain the balance of the ecosystem, natural resources and environment.

Keywords: Greenhouse gas reduction activities, Halal food, Waste management

¹ Environmental Science, School of Energy and Environment, University of Phayao

² Environmental Science Course, School of Energy and Environment, University of Phayao

* Corresponding author email: wangpatt1009@gmail.com

Oral Presentation

กลุ่มที่ 2 สาขาวิชาเคมี เคมีประยุกต์
และเคมีอุตสาหกรรม

High stability nanocellulose Pickering emulsion in control the release of eucalyptus oils

Pittaya Songchom¹ and Karaked Tedsree^{1,*}

Eucalyptus oil (EO) is a widely used essential oil. However, it has poor water solubility and instability, which limit its applications. Nanocellulose Pickering emulsions are emulsion systems stabilized by nanocellulose at the interface of oil and water. Eucalyptus oil-loaded nanocellulose Pickering emulsion is considered as a carrier for the controlled release of active agents. In this work, the cellulose nanofibrils were extracted from sugarcane leaves using a chemical method. Hemicellulose and lignin were removed by treating them with 5% w/v sodium hydroxide and bleaching with 10% v/v hydrogen peroxide, respectively. Cellulose nanofibrils (CNF) were obtained by hydrolysis with citric acids and further surface modified by coating with poly (dimethylsiloxane hydroxy-terminated) (PDMS-OH). The size, shape, and morphology of CNF were determined by TEM and SEM. Their surface structures and crystallinity were investigated by ATR-FTIR spectroscopy and X-ray diffraction techniques, respectively. The diameter of the obtained CNF was 3-5 nm and the length was about 200 nm. The ATR-FTIR spectra showed the peak at 1745 cm^{-1} , which was assigned to the C=O vibrations and confirmed the formation of ester groups after hydrolysis. Oil-in-Water Pickering Emulsions were produced by varying the oil-to-water ratio 10% via mixing the nanocellulose solution (2–15 wt%). Modification of CNFs with PDMS-OH allows for highly improved stability and dispersion of oil droplets. The Pickering emulsion (CNF) emulsions showed 100% stability after a month using a 20% oil volume as a constant and Zeta potential values around -27.4 mV, with Eucalyptus oil-loaded Pickering emulsions slowly releasing eucalyptol for a longer time, about 70% longer than without control.

Keywords: Cellulose nanofibrils, Eucalyptus oil, Pickering emulsion, Surface modification

¹ Nanocatalysis Laboratory, Department of Chemistry, Faculty of Science, Burapha University, Bangsaen, Chonburi, 20131

* Corresponding author email: karaked@go.buu.ac.th

**Chemical constituents and biological activities of essential oil
from *Mansoa alliacea* L. flowers**

Chitsanupong Somsriwattana¹, Thanachot Phophon¹ and Sorachai Khamsan^{2,*}

Mansoa alliacea L. is widely distributed in northern and northeastern of Thailand. This plant has been used in traditional medicine to treat a wide range of illnesses and used as an indigenous vegetable. The present study aimed to investigate the chemical components of the essential oil from *M. alliacea* flowers obtained from hydrodistillation and subsequently analyzed by using dynamic head-space sampling with gas chromatography-mass spectrometry (GC-MS) techniques. Twenty-three compounds accounting for 97.7% of the total essential oil were identified. The major volatile components of this oil were caryophyllene, 2-methyl butanol, methyl butyrate, (Z)-2-hexenol and acetic acid. The essential oil showed strong antimicrobial activity against *Escherichia coli* and exhibited moderate antimicrobial against *Staphylococcus aureus*.

Keywords: Antimicrobial activity, GC-MS, *Mansoa alliacea* L., Secondary metabolites,

¹ Demonstration school, University of Phayao, Phayao, 56000, Thailand

² School of Chemistry, University of Phayao, Phayao, 56000, Thailand

* Corresponding author email: sorachai.kh@up.ac.th

Developing composite adsorbent of activated carbon and CuAl-based material for removing Krajood dyes in water

Anek Khunphol¹, Lappamong Pattum¹ and Sonchai Intachai^{2,*}

This research was focused on developing methods for removing contaminated dyes in water by using composite adsorbents with a positively charged surface from copper-aluminium base (CuAl-LDH or LDO) and negatively charged surface from activated carbon. Composite adsorbent prepared by the solid-state method by grinding CuAl-LDH or LDO powder, activated carbon and magnetite for 30 min which use acetone as a medium using a weight ratio of 2:2:1. After that, the products obtained were identified by XRD and the interaction with the bar magnet. The amount of residual dye in the water was measured by UV-VIS. The study was conducted on the absorption of 50.0 ml of 100 ppm dye in water for 60 min. AC-LDO@Fe₃O₄ showed the removal efficiency of malachite green by 100%(ACR), 65%(ACD), and 52%(ACR), eriochrome black-T by 17%(ACR), 9%(ACN) and 11%(ACD) and red krajood dye by 92%(ACR), 90%(ACD) and 58%(ACN), respectively. The adsorption results showed that CuAl-LDH or LDO composites with activated carbon was a good adsorbent for the arrangement of both cationic (malachite green) and anion (eriochrome black-T) dyes. It can be easily separated from the wastewater solution by external magnet.

Keyword: Activated carbon, Layered double hydroxide, Layered double oxide, Magnetite

¹ Student, Paphayompittayakom School, SCIUS – Thaksin University, Phatthalung, 93210

² Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: sonchai.i@tsu.ac.th

Sago palm fiber nanocellulose as a sustainable adsorbent for malachite green dye removal and its application in environmental remediation

Sawarat Raksa^{1,*} and Kanyapatch Prommuak¹

The utilization of biomass by industries and researchers as an eco-friendly and industrially valuable material is still generating interest on a global scale. Sago fiber from the production of sago starch was used as a substrate for cellulose nanocrystals and applied for malachite green removal in the effluent of the Krajoed (*Lepironia articulata*) Handcraft dyeing industry. This research aimed to determine the appropriate concentration of sulfuric acid hydrolysis (30, 45, and 60 %w/w) for the production and characteristics of nanocellulose from sago fiber and its capacity to absorb malachite green dye. The optimal acid hydrolysis of α -cellulose to obtain was found at a sulfuric acid concentration of 60 %w/w and resulted in a heterogeneous mix of irregular-shaped particles with size pores of about \pm 69 nm nanocellulose. The yield of cellulose was 36.17% after treatment, with porous and fibrous diameters of 6.10 μ m. Nanocellulose to remove malachite green has maximum removal efficiencies of 91% under 20 ppm initial dye concentrations and an optimal mixing time of 60 min. The adsorption kinetics confirmed that the equilibrium data were best fitted to the Langmuir isothermal model with $R^2 = 0.99$, indicating the monolayer of dye molecule at the heterogeneous absorbent surface. These results demonstrate that cellulose nanocrystals from sago fiber are effective eco-adsorbents for removing malachite green dye and offer a new platform for dye removal.

Keywords: Acid hydrolysis, Fibers, Lignocellulose, Malachite green dye, Nanocellulose Sago

¹ Scientific Classrooms in the University- Affiliated School Project (SCIUS), Faculty of Science, Thaksin University, Phatthalung, 93210, Thailand

* Corresponding author email: Sawarak56@gmail.com

Conformational itinerary of melibiose during transglycosylation by α -galactosidase

Benyapa Karuehas¹, Kemissara Sudsom¹, Jitrayut Jittonom² and Wijitra Meelua^{1,2*}

At present, enzyme reactivity can be simulated with in silico methods to understand and design better properties of enzymes for human benefits in a sustainable society. A large data set generated from any protein simulations always makes the interpretation a challenging task in view of computational perspective. In this study, we make use of the previous simulated data (at the SCC-DFTB/CHARMM27 level) on a transglycosylation reaction (TG) with a melibiose in α -galactosidase (α GAL) of a family 27 glycoside hydrolase and analyze them with Cremer-Pople parameter calculator. With geometric reaction coordinate of TG with two acceptor molecules (melibiose and sucrose), it has been found that the sugar conformational change follows 1S_3 (reactant) \rightarrow 4H_3 (transition state) \rightarrow 4C_1 (product) in melibiose and ${}^4H_5/{}^4E$ (reactant) \rightarrow 4H_3 (transition state) \rightarrow 4C_3 (product) in sucrose during the reaction. The obtained results could improve current information on the sugar deformation in catalysis of α GAL and other related GHs.

Keywords: α -Galactosidase, Cremer-Pople parameter, Melibiose, Transglycosylation

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

²School of Science, University of Phayao, Phayao 56000, Thailand

*E-mail: wijitra.me@gmail.com

Mapping the conformational itinerary of galactomannan hydrolysis in α -galactosidase by Cremer-Pople analysis

Thamonwan Pattanapradit¹, Donlacha Chompooming¹, Wijitra Meelua^{1,2} and Jitrayut Jitnonm^{2,*}

α -galactosidase is useful for diagnosis of Fabry disease in male patients. In this study, the details of catalytic itinerary in α -galactosidase catalysing galactomannan hydrolysis were elucidated using Cremer-Pople parameter calculator. The input of the calculator is the Cartesian coordinates obtained from our previous simulation data (at SCC-DFTB/CHARMM27 level). The output of the analysis is the Cremer-Pople plot of substrate deformation, ${}^1{}^4B$ (reactant) \leftrightarrow 4H_3 (transition state) \leftrightarrow 4C_1 (product) and ${}^1{}^4B$ (reactant) \leftrightarrow 4H_3 (transition state) \leftrightarrow 4C_1 (product). The obtained results would be helpful in understanding the chemistry of carbohydrate deformation during catalysis of alpha-galactosidase acting on the galactomannan.

Keywords: α -Galactosidase, Cremer-Pople parameter, Galactomannan

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

² School of Science, University of Phayao, Phayao 56000, Thailand

* Corresponding author email: jitrayut.018@gmail.com

**Comparison in beta-glucan extraction from mixed defatted rice bran and khao
dawk mali defatted rice bran cultivars using taguchi method of
Experimental design**

Pattraporn Phuwadolpaisan^{1,*}

This research aims to compare the extraction of beta-glucan from mixed defatted rice bran and Khao Dow Mali defatted rice bran cultivars by studying factors affecting beta-glucan extraction. Five factors (four levels) were particle size of defatted rice bran (mm) (<75, 75-149, 150-250, non-separated), ratio of water (ml) to defatted rice bran (g) (5:1, 10:1, 15:1, 20:1), pH (4, 7, 8, 10), temperature (°C) (35, 45, 55, 60), and duration (h) (1, 3, 5, 7). According to the Taguchi method, the experiment was designed as an L16 (45) orthogonal array. The results found that the similarly optimal factors for extracting total beta-glucan from both defatted rice brans were 75-149 mm, 20:1, 55 °C, and 3 h. However, it has been shown that the optimal pH for both is different. The mixed defatted rice bran prefers to be extracted at pH 4, obtaining a total beta-glucan of 5.26 ± 0.05 mg/100 g of defatted rice bran. This is less than Khao Dow Mali defatted rice bran cultivars that prefer to extract at pH 10, which obtained a total beta-glucan of 12.35 ± 0.38 mg/100 g defatted rice bran. Based on the mean S/N ratio, the most influential factors were the ratio of water to defatted rice bran, followed by particle size, pH, temperature, and extraction time.

Keywords: Beta-Glucan, Defatted Rice Bran, Extraction, Taguchi Method

¹Department of Chemistry, Faculty of Science, Chandrakasem Rajabhat University, Bangkok, 10900

*corresponding author e-mail: pattraporn.p@chandra.ac.th

**Synthesis of the fatty acid ethyl esters (FAEE) from Krabok (*Irvingia Malayana*)
seed oil for use as the main ingredient in the production
of herbal massage oil**

Wuttichai Roschat^{1,2,*} Sunti Phewphong¹, Chonlapha Hachai^{1,2}, Kittisak Inthikhot^{1,2}, Kanthida Kiinti^{1,2} and Tappagorn Leelatam^{1,3}

This research was conducted to study the synthesis of fatty acid ethyl esters (FAEE) from Krabok (*Irvingia Malayana*) seed oil via the transesterification reaction for use as the main ingredient in the production of herbal massage oil. The results showed that the optimized condition for transesterification of the Krabok seed oil consisted of KOH catalyst content equal to 5% wt/wt compared to the weight of oil. The molar ratio of the ethanol to the Krabok seed oil was 15:1, the reaction time was 60 min, and the reaction temperature was 78 ± 3 °C. These conditions can produce a percentage yield of FAEE as high as $100.05 \pm 2.07\%$. The identification and chemical composition of the synthesized FAEE products were analyzed by FT-IR, ¹H and ¹³C-NMR, and GC techniques. The data found that the synthesized FREE product contained a functional group compound of the ester type and the chemical structure was a monoglyceride compound. The chemical composition was lauric acid (C_{12:0}) and myristic acid (C_{14:0}) as the main component which was 97.52% of saturated fatty acids. The physicochemical properties of the synthesized FAEE products showed a clear yellow liquid. The viscosity, density, cloud point, and pour point were 1.73 ± 0.03 cSt/s, 0.82 ± 0.00 g/cm³, 4 °C, and -1 °C, respectively. While the acid value, free fatty acids content, iodine value, water content, and oxidation stability were 0.702 ± 0.001 mg KOH/g of oil, 0.35 ± 0.001 wt.%, 0.59 ± 0.04 g I₂/100 g of oil, 1482.3 ± 6.15 ppm and >6 h, respectively. Therefore, FAEE synthesized from the Krabok seed oil is suitable to be used as a main ingredient to produce herbal massage oil products. Moreover, the use of local resources to produce various types of products also added value to the community's raw materials.

Keywords: Fatty acid ethyl ester (FAEE), Herbal massage oil, Krabok (*Irvingia Malayana*) Seed oil, Transesterification reaction,

¹ Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

² Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

³ Appropriated Technology Center, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000 Thailand

* Corresponding author email: sunti-sc@hotmail.com

Chemical properties of Novel polyhydroxyalkanoate from *Enterobacter* sp. using waste cooking oil as the substrate

Siwakorn Thongduang^{1,*}, Teetawat Meekhai¹, Jamjun Pechsiri² and Kanokphorn Sangkharak³

In this current study, novel polyhydroxyalkanoate (PHA) was produced by *Enterobacter* sp. using waste cooking oil as substrate. The optimal condition for PHA production was Nutrient broth (NB) medium supplemented with 2.5% waste cooking oil at 48 h of cultivation. The maximum PHA at 1.36±0.32 g/L and 61.82±0.32% cell dry mass (CDD) was obtained. The obtained polymer was firstly confirmed to be PHA by Fourier transform infrared spectroscopy (FTIR). Afterward, the monomer composition was analyzed by Gas Chromatography – mass spectrometer (GC-MS). The GC-MS spectrum revealed that the medium-chain-length-co-long-chain-length PHA (mcl-co-lcl PHA) containing C14, C15, C16, C17, and C18 at 1.02, 31.42, 23.90, 37.62, and 6.04 mol%, respectively was obtained. Interestingly, the highest mol% of C17 at 37.62% have never been reported so far. The economical analysis of PHA was also calculated. The price of PHA from waste cooking oil was 3.7 Baht/g while commercial PHA was 5 Baht/g. It can conclude that waste cooking oil able to be used as substrate for PHA. In addition, the novel PHA was also applied in aquaculture application as feed additive and the proper results were obtained.

Keywords: *Enterobacter* sp., Mcl-co-lcl PHA, Polyhydroxyalkanoate, Waste cooking oil,

¹ Science Classroom in University-Affiliated School Project, Thaksin University, Phatthalung, 93210

² Department of Biological and Environmental Science, Faculty of Science, Thaksin University, Phatthalung, 93210

³ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: time.siwakorn@gmail.com

Effect of Mitragynine extracted from Kratom leaves (*Mitragyna speciosa*) on inhibition of *Escherichia coli* and *Staphylococcus epidermidis*

Supitcha Tanyaros^{1,*}, Supinya Tanyaros¹, Kosin Teeparuksapun², Nicha Prasongchan²
and Wichulada Thavaroj³

The purpose of this study was to determine the concentrations of Mitragynine in grinded powder and the crude extracts from the green-veined and red-veined Kratom leaves, and to compare the inhibitory of 50 % ethanolic crude extracts from both types of Kratom leaves against *Escherichia coli* and *Staphylococcus Epidermidis*. From experiments, the concentration of Mitragynine from grinded powder from green-veined and red-veined Kratom leaves were ranged 240-270 mg/L and 180-240 mg/L, respectively, while the Mitragynine content of ethanolic extracts from green-veined and red-veined Kratom leaves were ranged 180-240 mg/L and 120-180 mg/L, respectively. A comparative study on inhibition of *E. coli* and *S. epidermidis* were tested, the results found that the crude extracts from Kratom leaves of both varieties at a concentration of 18 mg/mL were inhibited growth of *E. coli* and the crude extracts from Kratom leaves of both varieties at concentrations of 9 and 18 mg/mL were effective in inhibiting growth of *S. epidermidis* using 50%v/v ethanol as a control.

Keywords: *Escherichia coli*, Inhibition, *Mitragyna speciosa*, Mitragynine, *Staphylococcus Epidermidis*,

¹ PSU.Wittayanusorn School, Songkhla, 90110

² Major of Science, Faculty of Liberal Arts, Rajamangala University of Technology Srivijaya, Songkhla ,90000

³ Major of Food Science and Nutrition, Faculty of Liberal Arts, Rajamangala University of Technology Srivijaya, Songkhla, 90000

* Corresponding author email : 3545@psuwit.ac.th

Air filter paper coated with silver nanoparticles supported on activated carbon for antibacterial activity

Gingkarn Senatip^{1,*}, Pattarawadee Khunthep¹ and Panita Kongsune²

Air filters are commonly used to reduce airborne pollutants, and the recent outbreak of respiratory infections has highlighted their importance. Silver nanoparticles have been shown to effectively kill bacteria and viruses, but their aggregation can be a problem. The coffee ground-derived activated carbon as a support for immobilizing silver nanoparticles (AC-AgNPs) and then coated on filter paper for antibacterial activity is the main objective of this study. Coffee ground was activated with potassium hydroxide and carbonized at 600 °C to produce AC. The AC-AgNPs were synthesized through AC impregnation with 1.25%, 2.5%, 5%, and 10% AgNO₃ solutions. The AC-AgNPs samples were characterized using Fourier-Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDX), and UV–visible spectroscopic techniques. Antibacterial potential was evaluated for different concentrations of Ag-impregnated activated carbon, with 10% AC-AgNPs showing the greatest inhibition of both *S. aureus* and *E. coli*. This concentration was chosen to prepare air filter paper coated with silver nanoparticles supported on activated carbon for antibacterial activity. However, the inhibition activity result of air filter paper was slightly lower than that of 10% AC-AgNPs sample for both *S. aureus* and *E. coli*.

Keywords: Activated carbon, Antibacterial, Coffee ground, Silver nanoparticles

¹ SCIUS, Faculty of Science, Thaksin University, Phatthalung, 93210

² Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: 14077@tsu.ac.th

The search for bioactive compounds from a mushroom msucc 032 collected from Nakhon Phanom

Chiraphat Takpho¹, Jiraporn Panchompoo¹, Aphidech Sangdee², and Prapairat Seephonkai^{1,*}

The natural fruiting bodies of MSU 032 collected from Nakhon Phanom Province, Northeastern Thailand, have been chemically investigated for its bioactive compounds in this research. Living culture of MSUCC 032 was isolated, grown on PDA, and preserved at MSU. DNA extraction was performed for DNA sequence analysis. The species of *Serpula dendrocalami* was identified based on DNA data. Biological activity and chemical study of this species have never been reported. The fruiting bodies of *S. dendrocalami* were then extracted and extracts from dichloromethane, methanol and ethyl acetate were evaluated for their antibacterial and nitric oxide inhibitory activities. The extract from dichloromethane was subjected to purify by column chromatography technique both for silica gel and Sephadex LH-20 columns. As results, ergosterol was isolated as a major constituent from the dichloromethane extract of *S. dendrocalami* together with unique type of benzenoid derivatives. The structures of these isolated compounds were elucidated and confirmed based on spectroscopic data. NMR data, antibacterial and nitric oxide inhibitory activities of the extracts and the isolation of selected fractions will be presented.

Keywords: Bezenoid derivative, Bioactive compound, Ergosterol, Mushroom, *Serpula dendrocalami*

¹ Department of Chemistry, Faculty of Science, Mahasarakham University, Maha Sarakham, 44150

² Department of Biology, Faculty of Science, Mahasarakham University, Maha Sarakham, 44150

* Corresponding author email: prapairat.s@msu.ac.th

Intermolecular Interactions of Quinoline Derivatives to Human Serum Albumin using Fluorescence -spectroscopy, Molecular docking, and Molecular Dynamics Simulations.

Natchaphon Ngueanngam^{1,*}, Benchawan Jityuti¹, Suwicha Patnin², Pornthip Boonsri¹,
Arthit Makarasen² and Apinya Buranaprapuk¹

The study interaction of plasma proteins with drugs is essential to understand the pharmacodynamics and pharmacokinetics of drugs. The intermolecular interactions between human serum albumin (HSA) with the newly synthesized quinoline derivative, 2,4-disubstituted quinoline (Fig.1) was studied under physiological conditions. Accordingly, in this study, the binding interaction was evaluated in combination using fluorescence spectroscopy, molecular docking, and molecular dynamics simulations. The experimental results showed that the fluorescence of the protein was quenched by quinoline derivative through the static quenching mechanism. Molecular docking study showed that quinoline derivative bound to HSA at site III (subdomain IB). The binding constant (K_b) at the level of 10^4 Lmol^{-1} and binding mode based on thermodynamic parameters (298,308, and 318) suggested a spontaneous process, indicating that the interaction could be hydrogen bonding and van der Waals force. Additionally, molecular docking and molecular dynamics simulations (MD) supported the spectroscopic results. This study can provide information for the design and development of quinoline derivatives to enhance the potency against HIV-1 RT inhibitors in the future.

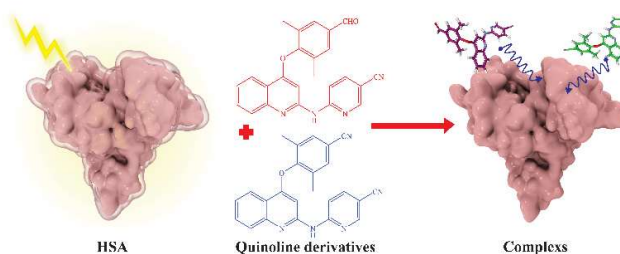


Fig1. Illustration for the analysis of the binding interaction of quinoline derivatives with HAS.

Keywords: Human serum albumin (HSA), Molecular docking, Molecular dynamics simulations (MD), Quinoline

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110, Thailand.

²Department of Chemistry, Laboratory of Organic Synthesis, Chulabhorn Research Institute, Laksi, Bangkok 10210, Thailand.

* Corresponding author email: Natchaphon.ngueanngam@g.swu.ac.th

Enhancing skin-like foam with plasticizers in latex rubber compound

Patchon Panjam¹, Jutarat Songsuwan¹, Nanthaphat Jarewsak², Weerawut Naebpetch³ and Panita Sumanatrakul^{4,*}

Glycerol and olive oil have been investigated as potential plasticizers for natural rubber latex compound. Increasing the concentration of both plasticizers resulted in softer surfaces and decreased hardness, but also reduced the tensile and tear strength of the rubber samples. However, glycerol provided higher tensile and tear strength than olive oil, likely due to its steric effect from bulky long chain structure. Glycerol exhibited a maximum tensile strength of 3.34 ± 0.68 MPa and a tear resistance of 1.42 ± 0.12 kN/mm. These findings suggest that glycerol can be an effective plasticizer for natural rubber latex-based biomedical products, such as injection training pads, as it not only enhances the softness of the material, but also improves its glossy and comfort on skin contact.

Keywords: Glycerol, Olive oil, Plasticizer, Rubber latex compound

¹SCIUS, Faculty of Science, Thaksin University, Phatthalung, 93210

²Faculty of Nursing, Thaksin University, Phatthalung, 93210

³Center of Rubber Technology for Community, Faculty of Engineering, Thaksin University, Phatthalung, 93210

⁴Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: spanita@tsu.ac.th

Quick and easy Chloride determination test kit analyzed by web application for groundwater samples

Kasama Kansorn¹, Natalie Mitware^{1,*} and Sarisa Phantham¹

Groundwater is a crucial source of daily consumption, and its quality is essential for human health and the environment. Recent research has revealed that the concentration of chloride in groundwater exceeds its safe limit of 250 ppm, which negatively impacts agricultural products. Titration is the most convenient method to determine chloride ion concentration, and Mohr's method, which utilizes Silver Nitrate (AgNO_3) and Potassium Chromate (K_2CrO_4), has been found to be the least hazardous. However, the titration method still requires a laboratory and time-consuming experimentation. To address these limitations, researchers have developed a chloride determination test kit and a web application for rapid calculation of chloride concentration by detecting color changes in the titration process. The test kit is optimized for AgNO_3 with a concentration of 5.13 mM and 0.2 mL of K_2CrO_4 as an indicator. The solution precipitation experiments showed that the G value from the RGB color value is unaffected. Moreover, it shown in analytical performance of the test kit including LOD is 56 mg/L, LOQ is 188 mg/L, and %RSD is in range of 1 - 4% which infers the effectiveness of the test kit using groundwater samples. In conclusion, the test kit and web application provide a convenient and efficient way to monitor groundwater quality and ensure the accuracy of chloride ion concentration determination.

Keywords: Chloride, Ground water, Mohr's Method, Test kit

¹Darunsikkhalai school, King Mongkut's University of Technology Thonburi, Tha Kham, Bang Khun Thian, Bangkok, 10150

*Corresponding author email: nataliemtw@gmail.com

The development of electrocatalysts for xylitol fuel cells

Phattharaphon Wichaidit^{1,*}, Kanyawat Tipsong¹ and Chakkrapong Chaiburi²

Fuel cells are a clean alternative energy technology that does not involve a combustion reaction and results in pollution issues. Alkaline direct liquid fuel cells have recently received increasing attention since they reduce the need for precious metals such as platinum as electrocatalysts. The discovery of electrocatalysts composed of cheap transition metals are urgent to replace the traditional Pt/C catalyst. This research aims to analyze and develop electrocatalysts used in membraneless alkaline xylitol fuel cells and focused anode catalysts based on PdCeO_x/C and Pd/C, cathode catalysts based on AgV_xO_y/C by using concentration at 0.1 M in xylitol solution fuel. The results using the PdCeO_x/C anode and AgV_xO_y/C cathode showed higher power density than using the Pd/C anode and AgV_xO_y/C cathode. The physical properties of the catalysts were investigated by scanning electron microscope. At the same time, the catalyst composition and chemical characterization were analysed by energy dispersive x-ray spectroscopy and the compounds were analyzed and identified by x-ray diffraction analyzer. This study provides databases for further research on direct liquid fuel cells (DLFCs) and electrocatalysts.

Keywords: Alkaline fuel cells, Electrocatalysts, Membraneless xylitol

¹ SCiUS-TSU, Paphayomphittayakom School, Thaksin University, 93210

² Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: 14105@tsu.ac.th

Synthesis of silver nanoparticles capped carbon dots as fluorescent probe for chromium(III) ion detection

Ratchadaporn Seedad¹, Pornpimol Prayongpan¹ and Kriangsak Songsrirote^{1,*}

Trivalent chromium (Cr^{3+}) ion is an essential micronutrient and widely used in supplement products. Deficiency of Cr^{3+} in the human body results in the risk of diabetes and cardiovascular disease. This work proposed the application of using nanocomposite material between silver nanoparticles and carbon dots (AgNPs@CDs) for the detection of Cr^{3+} . The AgNPs@CDs displayed maximum emission wavelength at 526 nm under the excitation wavelength of 406 nm, and the color change was readily observed with the naked eyes in the presence of Cr^{3+} . The detection of fluorescent quenching showed linearity range of 0.1-10 mg/L with the detection limit of 0.063 mg/L. This proposed method exhibits potential advantages in terms of simplicity, rapidity, sensitivity, selectivity, and low cost, which can be further developed as field test kit for Cr^{3+} determination in food supplement samples.

Keywords: Carbon dots, Chromium ion, Detection, Nanocomposite, Silver nanoparticles

¹ Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

*Corresponding author, email: kriangsaks@g.swu.ac.th

Oral Presentation

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์
สาขาวิชาสถิติ

On a problem of partitions of \mathbb{Z}_m with the same representation functions

Natthanan Deein^{*} and Nares Sawatraksa

For every integer m let \mathbb{Z}_m be the set of residue class modulo m such that $\mathbb{Z}_m = \{\bar{0}, \bar{1}, \bar{2}, \dots, \overline{m-1}\}$ when $\bar{x} = \{y \in \mathbb{Z} : x \equiv y \pmod{m}\}$. For $A \subseteq \mathbb{Z}_m$ and $\bar{n} \in \mathbb{Z}_m$ let

$$R_A(\bar{n}) = \left| \left\{ (\bar{x}, \bar{y}) \in A \times A : \bar{x} \oplus \bar{y} = \bar{n} \right\} \right|.$$

In this paper, we study Sárközy's problem in \mathbb{Z}_m with two subsets A and B of \mathbb{Z}_m such that $|(A \cup B) \setminus (A \cap B)| = m - 4$ and $R_A(\bar{n}) = R_B(\bar{n})$ for all $\bar{n} \in \mathbb{Z}_m$.

Keywords: Sárközy's Problem, Partition, Representation Function, Residue Class

Division of Mathematics and Statistics, Faculty of Science and Technology, Nakhon Sawan Rajabhat University, 60000

* Corresponding author email: por-math@hotmail.com

**The numbers of numerical semigroups $\{0\} \cup [a, b] \cup [c, d] \cup [e, \infty)$
with the same Frobenius number**

Ekkachai Laysirikul* and Natthawarun Pinin

For any positive integers a and b , we denote the set of integers x such that $a \leq x \leq b$ and the set of integers x such that $a \leq x$ by $[a, b]$ and $[a, \infty)$, respectively. Define S to be the set $\{0\} \cup [a, b] \cup [c, d] \cup [e, \infty)$ where $2 \leq a \leq b < c - 1$ and $c \leq d < e - 1$. In this undergraduate thesis, we find some necessary and sufficient conditions for S to be a numerical semigroup. Moreover, we count the number of numerical semigroups S with the same Frobenius number.

Keywords: Numerical Semigroup, Frobenius Number

Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: ekkachail@nu.ac.th

Reverse order laws for the (b, c) -inverse in Γ -ring

Thanapa Phothiphon and Nares Sawatraksa*

Given any Γ -semigroups or Γ -rings R and any $a, b, c \in R$, then a is called (b, c) -invertible if there exists $x \in R$ such that

$$x \in b\Gamma R\Gamma x \cap x\Gamma R\Gamma c, \quad x\alpha_1 a \beta_1 b = b \quad \text{and} \quad c\alpha_2 a \beta_2 x = c \quad \text{for some } \alpha_1, \alpha_2, \beta_1, \beta_2 \in \Gamma.$$

In this paper, we provide necessary and sufficient conditions for the reverse order law for one-sided (b, c) -inverses in Γ -rings to hold. Also, by using centralizers, we obtain the reverse order law for the (b, c) -inverse in Γ -rings.

Keywords: Generalized Inverse, Left (b, c) -Inverse, Reverse Order Laws, Right (b, c) -Inverse,

Division of Mathematics and Statistics, Faculty of Science and Technology, Nakhon Sawan Rajabhat University, Nakhon Sawan 60000

* Corresponding author email: nares.sa@nsru.ac.th

Absorption laws for the (b, c) -inverse in Γ -ring

Phonthip Kanalak and Nares Sawatraksa*

Let $a, b \in R$ be two invertible elements. It is well known that the equality $a^{-1} + b^{-1} = a^{-1}(a+b)b^{-1}$ is known as the absorption law of invertible elements. In this paper, we introduce the concept of a new class of outer inverse in the setting of Γ -semigroups or Γ -rings, namely, the (b, c) -inverse. Given any Γ -semigroups or Γ -rings R and any $a, b, c \in R$, then a is called (b, c) -invertible if there exists $x \in R$ such that

$$x \in b\Gamma R\Gamma x \cap x\Gamma R\Gamma c, \quad x\alpha_1 a \beta_1 b = b \quad \text{and} \quad c\alpha_2 a \beta_2 x = c \quad \text{for some } \alpha_1, \alpha_2, \beta_1, \beta_2 \in \Gamma.$$

Necessary and sufficient conditions for the existence of these new generalized inverses are obtained. Moreover, we give several conditions so that the absorption law for one-sided (b, c) -inverses in Γ -rings holds. Also, by using centralizers, we obtain the absorption law for the (b, c) -inverse in Γ -rings.

Keywords: Absorption laws, Generalized Inverse, Left (b, c) -Inverse, Right (b, c) -Inverse,

Division of Mathematics and Statistics, Faculty of Science and Technology, Nakhon Sawan Rajabhat University, Nakhon Sawan 60000

* Corresponding author email: nares.sa@nsru.ac.th

On isomorphisms between generalized quaternion rings and matrix rings over certain finite fields

Thanapon Plaiduang, Pattadon Keawpeai, Nalinthip Nadsapat and Siripong Sirisuk*

Let $\alpha, \beta \in \mathbb{Z}_p \setminus \{0\}$. The generalized quaternion ring $\mathbb{Z}_p[i, j, k; \alpha, \beta] = \{a + bi + cj + dk \mid a, b, c, d \in \mathbb{Z}_p\}$ is a ring in which the multiplication is obtained from $i^2 = \alpha, j^2 = \beta$, and $ij = -ji = k$. In this work, we present five isomorphisms between $\mathbb{Z}_p[i, j, k; \alpha, \beta]$ and matrix ring $M_2(\mathbb{Z}_p)$. Moreover, three of these isomorphisms generalize the isomorphisms between quaternion ring $\mathbb{Z}_p[i, j, k; -1, -1]$ and $M_2(\mathbb{Z}_p)$ studied by A. Amir et al.

Keywords: Finite field, Isomorphism, Quaternion Ring, Generalized Quaternion Ring

Department of Mathematics and Statistics, Faculty of Science and Technology, Thammasat University, Pathum Thani, 12120

* Corresponding author email: siripong@mathstat.sci.tu.ac.th

(1 + u)-Constacyclic and cyclic codes over $\mathbb{F}_2[u]/\langle u^4 \rangle$

Supphachai Sonwai and Chakkrid Klin-eam*

Linear $(1 + u)$ -constacyclic codes and linear cyclic codes over $R := \mathbb{F}_2[u]/\langle u^4 \rangle = \mathbb{F}_2 + u\mathbb{F}_2 + u^2\mathbb{F}_2 + u^3\mathbb{F}_2$, where $u^4 = 0$, were introduced in this work. The algebraic properties of such codes were also studied. The Gray map Φ , which is both an isometry and a weight-preserving map from R^n to \mathbb{F}_2^{4n} , and the permutation π of \mathbb{F}_2^{4n} , defined by using the permutation τ of $\{0, 1, \dots, 4n - 1\}$, were given in this work. We prove that if $n \equiv 3 \pmod{4}$, then the Gray image of a linear cyclic code over R of length n , which is a binary code, is equivalent to a linear cyclic code by using the fact that the Gray image of a linear $(1 + u)$ -constacyclic code over R is a binary distance invariant linear cyclic code.

Keywords: $(1 + u)$ -Constacyclic Code, Cyclic Code, Gray Image, Gray Map

Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: chakkridk@nu.ac.th

On absorb BE-algebras

Attaphol Pumila* and Pongpun Julta

In this paper, we first introduce the notion of absorb in BE-algebras. Next, we provide some properties of absorb. We also describe connections between absorbs, terminal sections and upper sets, we will call BE-algebras at all members is absorb as absorb BE-algebras. Finally, we discuss relations between absorb BE-algebras and dual BCK-algebras.

Keywords: Absorb, Terminal Section, Upper Set, Absorb BE-algebra, Dual BCK-algebra

Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok, Thailand

*corresponding author, e-mail: attaphol.p@psru.ac.th

Upper bounds for the total domination numbers of Cartesian products of directed cycles

Kamonwan Chawong, Panaphan Suksawat, Supuk Seepeakaew and Yanisa Chaiya*

Let $\gamma_t(C_{13} \square C_n)$ be the domination number of the Cartesian product of directed cycles C_{13} and C_n , where n is any positive odd integer. In this research, we prove that

$$\gamma_t(C_{13} \square C_n) \leq \begin{cases} \left\lceil \frac{13n}{2} \right\rceil + 1, & n \equiv 11, 19 \pmod{26}, \\ \left\lceil \frac{13n}{2} \right\rceil + 2, & n \equiv 23 \pmod{26}, \\ \left\lceil \frac{13n}{2} \right\rceil + 3, & n \equiv 1, 3, 5, 7, 17, 21, 25 \pmod{26}, \\ \left\lceil \frac{13n}{2} \right\rceil + 4, & n \equiv 9 \pmod{26}, \\ \left\lceil \frac{13n}{2} \right\rceil + 6, & n \equiv 13 \pmod{26}, \end{cases}$$

and $\gamma_t(C_{13} \square C_n) = \left\lceil \frac{13n}{2} \right\rceil$, when $n \equiv 15 \pmod{26}$. These results extend the known results in [R. Shaheen, *Total Domination Number of Products of Two Directed Cycles*, *Utilitas Mathematica*, vol. 93, pp. 235-250, 2013.]

Keywords: Cartesian Products, Directed Cycles, Total Dominating Set, Total Domination Number

Department of Mathematics and Statistics, Faculty of Science and Technology, Thammasat University, Pathum Thani, 12120

* Corresponding author email: yanisa@mathstat.sci.tu.ac.th

The k -domination number and connected k -domination number in wheel related graphs.

Prangthong Singkaew and Supalak Srinin^{*}

Let $G = (V(G), E(G))$ be a simple graph and k a positive integer. Let $D \subseteq V(G)$. D is a dominating set of G if every vertex of G is either an element of D or is adjacent to a vertex in D . D is a k -dominating set if D is a dominating set and every vertex in $V(G) \setminus D$ is adjacent to at least k vertices in D . The k -domination number $\gamma_k(G)$ is the minimum cardinality among all k -dominating sets of G . For a connected graph G , D is a connected k -dominating set of G if D is a k -dominating set of G and the induced subgraph $G[D]$ is connected. The connected k -domination number $\gamma_k^c(G)$ is the minimum cardinality among all connected k -dominating sets of G . In this work, we investigate the k -domination number and connected k -domination number in the wheel graph, the helm graph, the flower graph, and the sunflower graph.

Keywords: Connected k -Domination Number, Flower Graph, Helm Graph, k -Domination Number, Sunflower Graph

Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 6500

^{*} Corresponding author email: supalaks@nu.ac.th

Statistical estimation for the median of the Delta-lognormal distribution

Usanee Janthasuwat, Suparat Niwitpong and Sa-Aat Niwitpong*

The purpose of this research was to construct a confidence interval for the median of the delta-lognormal distribution. The proposed confidence intervals are comprised of three intervals: the Normal Approximation (NA), the Generalized Confidence Interval (GCI), and the Method of Variance Estimates Recovery (MOVER). This research compares the performance of these confidence intervals using Monte Carlo simulations. This was determined by the coverage probabilities greater than or equal to the nominal confidence level of 0.95 and the expected length of the shortest confidence interval. The result showed that the GCI coverage probabilities were greater than the nominal confidence level in all cases and worked well when the sample size was small. The MOVER provided the shortest expected length of the confidence interval. It also performs well for large sample sizes. Additionally, all confidence intervals were illustrated using datasets of rainfall amounts in Thailand.

Keywords: Median, Delta-lognormal Distribution, Normal Approximation, Generalized Confidence Interval, Method of Variance Estimates Recovery

Department of Applied Statistics, Faculty of Applied Science, King Mongkut's University of Technology North Bangkok

*Corresponding author, email: sa-aat.n@sci.kmutnb.ac.th

Confidence intervals for the mean of Birnbaum-Saunders distribution

Natchaya Ratasukharom, Sa-Aat Niwitpong* and Suparat Niwitpong

This paper proposes new confidence intervals for the mean of Birnbaum-Saunders distribution based on the bootstrap confidence interval (BCI) and generalized confidence interval (GCI). The simulation study was performed using the R statistical package to evaluate the coverage probabilities and average lengths based on 5,000 independently generated replications. The sample sizes in the simulation study were set as $n = 10, 20, 30, 50, \text{ or } 100$ with shape parameter $\alpha = 0.10, 0.25, 0.50, 0.75, \text{ or } 1.00$. The simulation results showed that the coverage probabilities of the GCI were greater than or close to the nominal confidence interval of 0.95. The average lengths of the proposed confidence intervals trended to decrease when the sample size increased and the shape parameter decreased. Wind speed data from Chiang Mai and Lampang provinces, Thailand, collected in April to June 2022, were used to demonstrate the efficacy of the proposed methods, the results of which agreed well with the findings of the simulation study.

Keywords: Confidence Interval, Birnbaum–Saunders (BS) Distribution, Mean, Bootstrap, Generalized Confidence Interval

Department of Applied Statistics, Faculty of Applied Science, King Mongkut's University of Technology North Bangkok, Bangkok, 10800

*Corresponding author, email: sa-aat.n@sci.kmutnb.ac.th

Non-parametric bootstrap confidence intervals for the population mean of the zero-truncated Poisson-Aradhana distribution

Wararit Panichkitkosolkul

Recently, the zero-truncated Poisson-Aradhana distribution has been proposed for studying non-zero count data, which is of primary interest in several fields, such as biological science, medical science, demography, ecology and technology. However, estimating the confidence interval for its population mean has not yet been examined. In this study, confidence interval estimation based on the percentile, basic, and biased-corrected and accelerated bootstrap methods was examined in terms of their coverage probabilities and average lengths via Monte Carlo simulation. The results indicate that attaining the nominal confidence level using the non-parametric bootstrap confidence intervals was not possible for small sample sizes regardless of the other settings. Moreover, when the sample size was large, the performances of the confidence intervals were not substantially different. Overall, the bias-corrected and accelerated bootstrap confidence interval outperformed the others for large sample sizes. Lastly, the efficacies of the non-parametric bootstrap confidence intervals were illustrated by applying them to unrest events data from Thailand, and agriculture data from USA, the results of which match those from the simulation study.

Keywords: Interval Estimation, Count Data, Aradhana Distribution, Bootstrap Interval, Simulation

Department of Mathematics and Statistics, Faculty of Science and Technology, Thammasat University, Phatum Thani, 12120, Thailand.

e-mail: wararit@mathstat.sci.tu.ac.th

The SARIMA-ANN models study for forecasting the number of dengue patients in Phitsanulok province

Tippaporn Wangkeeree and Thipwan Kate-in *

The goal of this research was to evaluate the ability of models to predict the number of dengue patients in the province of Phitsanulok. In this research, the hybrid method, an artificial neural network method, and the Box and Jenkins method are used. The information covers the period from January 2014 to June 2022. The first data set, used to build and choose the prediction model, covers 84 months, from January 2014 to December 2020. The second data collection, which spans 18 months from January 2021 to June 2022, is used to assess the forecast model's precision. The lowest mean absolute error serves as the criterion. (MAPE). The hybrid model is the most suitable model for predicting the number of dengue patients in the province of Phitsanulok, according to the statistics. The predicted values are $SARIMA(1, 0, 0)(0, 1, 1)_{12}$ model (\hat{L}_t), and the residuals are derived from ANN model (\hat{N}_t) by using an 8-node hidden layer. Then, the hybrid model is $\hat{y}_t = \hat{L}_t + \hat{N}_t$.

Keywords: Number of Dengue Patients, Box and Jenkins Method, Artificial Neural Network Method, Hybrid Method

Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: thipwank@nu.ac.th

Flood forecasting model at M.5 Rasri Salai Station

Pongsakorn Molsin* and Orawich Kumphon

In this study, the Artificial Neural Network (ANN) was applied to flood warning system at M.5 Station, Mun river. Daily data viz discharge, precipitation, maximum temperature, and evapotranspiration from the years 2018 to 2021 were supported by Meteorological Department and the runoff measuring stations. The performance of the model was measured via the Nash-Sutcliffe Efficiency (NSE) and Root Mean Squared Error (RMSE). The results show that, with higher value of NSE ($> 75\%$), ANN can be used to the flood warning system.

Keywords: Flood, Artificial Neural Network, Performance

Department of Mathematics, Faculty of Science, Maharakham University, Maharakham, 44150

* Corresponding author email: 64010256002@msu.ac.th

The expected lottery prize and the accuracy of two digits lottery number

Kodchapon Deein* and Kanyanat Buabang

This project has to study the expected returns and the validity of the last 2 digits of the government lottery numbers. The researcher collects 496 draws from the Government Lottery Office from 16 January 2002 to 16 September 2022, calculates the expected return, and tests its validity with a chi-square test. The study found that expected return from buying government lottery tickets, 1st prize equals -74 baht, 2nd prize equals -79 baht, 3rd prize equals -79.2 baht, 4th prize equals -78 baht, 5th prize equals -78 baht, last 2 digits equal -60 baht, and the last 2 digits are drawn according to the proportion of each prize number. There was no difference at the significance level of 0.05.

Keywords: Expected Returns, Lottery, Significance Level of 0.05, Validity

High school, Naresuan University Secondary Demonstration School, Phitsanulok, 65000

* Corresponding author email: kodchapon65@nu.ac.th

Estimating the expected return from investing in stocks

Punnaphat Siangchin^{*}, Suphanat Phuttharak and Praphaporn Sanganusat

The impact of the COVID-19 epidemic causes experienced an economic downturn in Thailand, resulting in the interest rates in various financial institutions decreasing. Investment in stocks is therefore an important option to make capital. Investors can return more returns than those deposited with the bank.

SET50 shares are shares of companies with high market capitalization and trading consistently liquidity the top 50, resulting in investment in this group of stocks being very stable. Therefore, this research was intended to study the expected return rate from SET50 that can be used as information for those interested in investing in SET50 shares.

Calculating the expected return rate consists of 4 main parts.

Begin with choosing the top 5 companies with the highest market capitalization. Continued with collecting the closing price data from 1st January 2021 until 31st December 2022 in each quarter of all 5 companies and calculating the rate of return. After that, use the rate of return to calculate the variance and covariances of each stock. Finally, use Matrix to find the expected return rate, the fluctuation of expected return rates, and the investment ratio of each share in that port from variance and covariances value.

The calculation results show that the top 3 port that has the most expected return rate is

1) PTTEP, Gulf, and CPAAL port, 2) port, PTTEP, Gulf, and CPALL, 3) AOT, PTTEP port, And GULF.

And the least 3 returns of return rates ports are 1) AOT, CPALL, GULF, PTTEP 2) port, PTT, GULF, and CPALL.

3) AOT, PTT, PTTEP and CPALL ports.

According to expected return rates and variability rates, return rates can be made as information for investors' decisions. If you want a high return, choose a port that you have. The rate of return is very expected.

If you want investment stability, you should choose shares with low return rates.

Keywords: Expected Return, Market Capitalization, Variance

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

^{*} Corresponding author email: punnaphats65@nu.ac.

The performance comparison of classification by state of business about construction and real estate in Thailand

Mallika Chanaphai and Thipwan Kate-intra*

The purpose of this study is to evaluate how effectively building and real estate businesses are classified. The business status of 1,166 sample units is classified using the following factors: type of juristic person, registered capital, total revenue, net profit and loss, and total assets. The categorization methods for decision tree, random forest, k-nearest neighbours, and logistic regression analysis used 5 cross validation and 10 cross validation, respectively, and were contrasted according to the accuracy standards. It was determined that when the data were split into five parts, the random forest method had the most accuracy of 73.76%, and when the data were divided into ten parts, the decision tree method had the most accuracy of 73.33%. Data mining technique and logistic regression analysis were compared for classification, and it was discovered that the accuracy of the classification by logistic regression was 72.46%.

Keywords: Business, State of Business, Registered Juristic Person, Data Mining Technique, Logistic Regression Analysis

Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: thipwank@nu.ac.th

Optimization of batik production using the quick simplex method

Jeerawan Patcharaprakiti^{1,*}, Rattikan Jakkawan¹ and Nopporn Patcharaprakiti²

In this paper, our purpose is to calculate the amount of Lampung batik production of the Andanan Batik Lampung company in Indonesia. There are 3 types of batik: printed batik, handmade batik and batik scarf that resulted in the maximum profit using the quick simplex method compared with the simplex method. When we calculated using the simplex method, it was found that the Lampung batik production of the Andanan Batik Lampung company should be produced printed batik (4.05 dozen) and handmade batik (5.51 dozen) for the maximum profit 652,530 IDR. Moreover, when we calculated using the quick simplex method it was found that this method reduced the calculation process of the simplex table. The simplex method used 3 tables, but the quick simplex method used only 2 tables, which gave the same answer as the simplex method. In addition, Python programs were used to help verify the results. In order to achieve the maximum profitability of each type of batik production, it was found that the quick simplex method took time less than the simplex method, which was 0.21457 seconds.

Keywords: Optimization, Linear Programming, Simplex Method, Quick Simplex Method

¹ Division of Mathematics, Maejo University, Chiangmai, Thailand

² Department of Electrical Engineering, Rajamangala University of Technology Lanna, Chiangmai, Thailand

*Corresponding author, email: jeerawan_s@mju.ac.th

Comparison of algorithm performance for a forecasting insurance premium payment suspension during the contract of the insured by using the machine learning technique

Chiraphon Aphirakmongkhon and Jeerawan Patcharaprakiti*

This research presented comparison of algorithm performance for a forecasting insurance premium payment suspension during the contract of the insured by using the machine learning technique. Classification method of different data 3 methods such as Naive Bayes, Decision Tree and Random Forest are studied. The 240 lists of data independent variables are composed of gender, personal status, start age of life insurance, age now, type of insurance, sum insured, period of protection, period of payment insurance premium, payment mode, insurance policy at now. The dependent variable is premium payment status. The research results comparison of classification performance that Naive Bayes technique highest accuracy is 100%, Random Forest technique accuracy is 78% and Decision Tree technique accuracy is 74.90% respectively. Therefore, the model using the Naive Bayes technique can be used for continuous promotional information marketing plan. And strategies for taking care of the insured of the insurance company.

Keyword: Insurance Premium Payment Suspension during the Contract, Machine Learning, Naive Bayes, Decision Tree, Random Forest

Division of Mathematics Faculty of Science, Maejo University, Chiangmai, 50290

* Corresponding author email: jeerawan@gmail.com

A Classification of black mold image of longan leaves with deep learning techniques based on convolution neural network

Chiraphon Aphirakmongkhon, Wanlaya Keawcha, Grienggrai Rajchakit and
Jeerawan Patcharaprakiti*

The purposes of this research are to study the deep learning by using convolutional neural network and develop an algorithm for sooty mold classification on longan leaves using deep learning. The image correction of sooty mold on longan leaves and longan green leaves for training data deep machine learning using convolutional neural network. The results of the method has image of sooty mold on longan leaves when used activation function Rectified Linear Unit (ReLU) which the accuracy is 96 %. After that the developer algorithm is used to classify sooty mold image on longan leaves to help prevent the spread of sooty mold and reduce damage to longan yield.

Keywords: Image of Sooty Mold, Longan Leaves, Deep Learning, Convolutional Neural Network

Division of Mathematics Faculty of Science, Maejo University, Chiangmai, 50290

* Corresponding author email: jeerawan@gmail.com

Modified Jungck S-iteration to generate polynomiographs applicable in nonlinear complex functions

Suwicha Dungfull¹, Tanakit Thianwan² and Chonjaroen Chairatsiripong^{2,*}

The modified Jungck S-iteration schemes were established in this work by applying the Jungck iteration schemes to the S- iteration schemes, and this work transforms the problem of nonlinear equations into two differentiable functions. It approximates the solution of the nonlinear equation by modified Jungck S iteration schemes. In application, we use Modified Jungck S-iteration schemes to generate polynomiographs for complex nonlinear functions without Newton's method and study the patterns formed by changing the coefficients into different values.

Keywords: Modified Jungck S-Iteration Schemes, Nonlinear Complex Functions, Polynomiographs

¹ Department of Mathematics, Demonstration School, University of Phayao, Phayao, 56000

² Department of Mathematics, School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: chonjaroen.ch@up.ac.th

A mathematical model of hand, foot, and mouth disease with the investigation of the lockdown effect

Chanita Ruksakul and Sineenart Srimongkol*

Hand, Foot, and Mouth Disease is a transmission disease, mostly found in children. There are various mathematical models investigating the endemic disease. The SIR model is the primary one. In this work, the effect of lockdown is studied using the SIQR model. The qualitative analysis is carried out, which results in the calculation of two steady states for both disease-free and endemic equilibrium, as well as the investigation of sensitivity. It is also found that the basic reproduction number increases when the growth rate and infectious rate increase. The local stability of disease-free equilibrium is stable when the basic reproduction number is less than one. The parameters of the model are based on data from Thailand. The numerical results show that the lockdown is affected the endemic of hand, foot, and mouth disease. The number of lockdown infected individuals increases while the number of recovery individuals decreases.

Keywords: Mathematical Model, SIQR Model, Quantitative Analysis, Qualitative Analysis, Hand, Foot, and Mouth Disease

Department of Mathematics, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: sineenart@buu.ac.th

A mathematical model of COVID-19 with control strategies and its dynamics

Buddharak Sodtana^{1,*}, Nasha Narapinit¹ and Chairat Modnak²

COVID-19 is an infectious disease caused by the coronavirus. For this research, we formulated a mathematical model of COVID-19 for studying the transmission dynamics of the pandemic, and our model with eight differential equations representing the dynamics of an individual was formulated based on data collected by the Thailand Public Health Administration, which were transformed into equations. Then we perform analytical and numerical testing on our model: First, we analyze the system properties, including the boundedness of the solutions, the existence of disease-free equilibrium and endemic equilibrium points, and the local stability of equilibrium points. Besides, we compute the basic reproduction number, and the stability of the disease-free equilibrium point is verified using the Jacobian matrix. Next, we conduct numerical simulations using Euler's method, illustrating approximate solutions of the system of differential equations, to confirm our theoretical analysis through MATLAB programming. Then, we explore control measures by adding control terms to the model. The control terms depend on time; thus, we can investigate strategies for intervention programs through control measures. We explore control measures to find appropriate strategies for Thailand. The results suggest that when the disease starts spreading, control programs should be deployed as soon as possible. The infection curves from our model show similar trends to the recorded data from the COVID-19-infected cases reported from April 1, 2021, to December 31, 2021, in Thailand.

Keywords: COVID-19, Epidemiology, Mathematical Model, The Basic Reproduction Number, Stability

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

² Department of Mathematics, Faculty of Science, Naresuan University, Phitsanulok, 65000

*Corresponding author, email: buddharaks64@nu.ac.th

Study of the 5th wave of COVID-19 outbreak in Thailand using Mathematical Model

Pannathon Kreabkhontho

Coronavirus disease 2019 (COVID-19) is a respiratory disease that spreads from person to person through microscopic droplets caused by coughing or sneezing. Thailand has been affected by the COVID-19 outbreak, causing disruption in the economy, trade, manufacturing, tourism industry, and many other areas. The study of COVID-19 has become a global priority as scientists and researchers work to understand the virus and develop effective treatments and vaccines to combat its spread. In this paper, we constructed the mathematical model ($SS_vIH_1CH_2RD$) describing the dynamics of COVID-19 transmission, where the population was divided into eight compartments: the susceptible population (S), the vaccinated vulnerable population (S_v), the infected population (I), the infected population admitted to the hospital (H_1), the infected population admitted to the emergency room (C), the recovering population in the hospital (H_2), the recovered population (R) and the population who died from COVID-19 (D), respectively. We focus on the vaccinated population and determine whether each vaccination has an impact on the spread of the disease. The data from the 5th wave of COVID-19 in Thailand was used as a case study. The model was then constructed as a system of deterministic Ordinary Differential equations (ODE). The equilibrium point was then determined by solving the resulting model. The basic reproduction number (R_0) and the effective reproduction number (R_t) were also determined using the next generation matrix. The results of checking the effective reproduction number (R_t) showed that each vaccination over time resulted in a decrease in infection and disease transmission. The aforementioned model is a model for studying and planning disease outbreak control with vaccination measures.

Keywords: Basic Reproduction Number, COVID-19, Equilibrium Point, Mathematical Model, Effective Reproduction Number

Department of Mathematical, Faculty of Science, Mahasarakham University, Mahasarakham, 44150

email: 64010256001@msu.ac.th

Mathematical models to predict the inhibitory effect of *Staphylococcus aureus* by clove extract

Sippakorn Kuntan¹, Akarawin Rattanawong¹, Konvika Kongkul^{2,*} and Preuttiorn Supaphon³

This research aims to 1) study the antibacterial activity of clove extract on two strains of *Staphylococcus aureus* (*S. aureus* ATCC25923 and Methicillin-resistance *S. aureus*), 2) propose the mathematical models to predict the number of pathogens *S. aureus* and Methicillin-resistance *S. aureus* (MRSA) inhibited with clove extract for each concentration at any time, and 3) compare the predicted results by the mathematical models with the experimental actual data. The investigation of antibacterial activity was performed using colorimetric broth microdilution test. Clove extract showed good minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) values. The time-kill study on bactericidal activity against *S. aureus* and MRSA showed that clove extract at concentrations of 3.2 mg/ml and 6.4 mg/ml were able to kill *S. aureus* and MRSA, respectively, completely at 2 hours.

In this study, the appropriate mathematical models, Modified Gompertz and logistic models were proposed to predict the number of pathogens *S. aureus* and MRSA inhibited with clove extract for each concentration. The predicted results using these mathematical models to account for the number of *S. aureus* and MRSA were compared with the actual experimental data. The suitability and efficiency of the model were determined by statistical parameters including mean percentage error, mean bias error, root mean square error and the coefficient of determination (R^2).

Keywords: *Staphylococcus Aureus*, Methicillin-Resistant *Staphylococcus Aureus*, Mathematical Models, Clove Extract

¹ SciUS TSU, Paphayompittayakom School and Thaksin University, Phatthalung, 93210

² Department of Mathematics and Statistics, Faculty of Science, Thaksin University, Phatthalung, 93210

³ Department of Biology, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: konvika@tsu.ac.th

Oral Presentation

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา
และคณิตศาสตร์ศึกษา

**The organization of learning activities on the factorization of one variable
two-degree polynomial using games base learning to promote
algebraic thinking of grades 8 students**

Thanajirawat Srisuthunyavong¹ and Nutjira Busadee^{2,*}

This research is action research conducted in the classroom, aimed at studying the effects of using game-based learning activities to promote algebraic thinking skills in the topic of separating the components of a quadratic polynomial with a single variable among second-year high school students in the second semester of the academic year 2023. The target group consisted of 18 students from Grades 8 at Wat Thasatoi Municipal School. The research tools used included (1) 12 lesson plans using game-based learning activities on the topic of separating the components of a quadratic polynomial with a single variable, consisting of four steps: 1) Introduction to the lesson, 2) Learning activity, 3) Summary, and 4) Evaluation, and (2) algebraic thinking test to measure students' ability.

The research found that the use of game-based learning activities to promote algebraic thinking skills in the topic of separating the components of a quadratic polynomial with a single variable among second-year high school students resulted in an average score of 1.69 out of 4, which was in the acceptable range.

Keywords: Algebraic Thinking, Factoring of Single-Degree Polynomials, Game Based Learning Activities

¹ Master of Education Student Program in Mathematics Education, Faculty of Education, Chiang Mai University, Thailand

² Advisor, Lecturer Dr., Department of Curriculum, Teaching and Learning, Faculty of Education, Chiang Mai University, Thailand

* Corresponding author email: nnuutt37@hotmail.com

Effects of education programs in science museum using Inquiry and Storyline approach on science learning motivation

Phattraporn Thongkesorn^{1,*} and Chanyah Dahsah²

Promoting science learning motivation is a core mission of the science museum. This research aimed to compare the effect of education programs in science museums using inquiry and storyline approach and normal inquiry approach on science learning motivation of upper elementary students using true experimental research. The samples consisted of 60 upper elementary students who participated science lab activities in Rama 9 museum of the National Science Museum (NSM), Thailand. They were obtained from convenience sampling. The research instruments consisted of 1) Science lab activities plan using inquiry and storyline approach, and normal inquiry approach; and 2) science learning motivation questionnaire. Data were analyzed using mean (\bar{X}), standard deviation (S.D.), t-test and analysis of covariance. The results showed that; the post-test mean score of science learning motivation of students participate in science lab activities in science museum were higher than pre-test mean score. In addition, the science learning motivation of students who participated in science lab activities using inquiry and storyline approach was statistically higher than students who participated in science lab activities using normal inquiry approach at the significance level .05.

Keywords: Inquiry, Science Learning Motivation, Science Museum, Storyline

¹ Graduate Student, Master's degree in Science Education, Faculty of Science, Srinakharinwirot University.

² Assistant Professor at Science Education Center, Faculty of Science, Srinakharinwirot University

* Corresponding author, email: phattraporn.thong@g.swu.ac.th

Learning management by using Model-Based Inquiry and Scientific Experiments for developing mental model for 7th grade students

Thanarat Sabsom^{1,*}, Ratchanon Intakhun¹ and Jatutip Kaya¹

This research aimed to examine students' mental models in Cell Transport and investigate ways to develop students' mental models in in Cell Transport through Model-Based Inquiry and Scientific Experiments by using classroom action research. Researcher collected data from reflective journals and mental model test. Qualitative data were analyzed by inductive process such as categorizing, comparing and concluding. In the research findings, I found the way to teach for improving students' mental models as follow: using videos to show difference between abstract and concrete changes through comparison can improves students' mental models to scientific models; teaching sequences should start with engaging students with questions then find the answer, and let them build models and discuss with whole class; having students getting involved with or had the experience with improves students' metal models as well as using challenged questions, answering with questions and discussing questions in the whole class. I also found that MBI could enhance most students' mental models in Cell Transport in correct mental models.

Keywords: Cell Transport, Mental models, Model-based inquiry, Scientific Experiments

¹ Department of General Science, Faculty of Science, Lampang Rajabhat University, Lampang, 52100

* Corresponding author email: thanarat581280@gmail.com

**Model-Based learning activities combined with Game-Based Teaching Methods
promote critical thinking skills in The Earth and Natural Resources
Learning Unit for junior high school students**

Amphorn Aryiku¹, Phatcharapa Khongman¹, and Phitsanuphakhin Chaimongkhon^{2,*}

The purposes of this research were to compare the learning outcomes before and after the learning management of the world and natural resources learning unit by using model-based and game-based teaching methods, to compare learning outcomes after learning with the passing criteria at 70%, to study on promoting students' analytical thinking skills, to compare the promotion of students' analytical thinking skills with the passing criteria at 80%, and to analyze student satisfaction with learning management. Participants were Grade 8 students from 2 schools in Chiang Mai Province: 15 students from Ban Sam Lang School, Doi Lo District, and 15 students from Mae Pong Pracha Samakkee School, Doi Saket District, who are studying in the second semester of the academic year 2022. The research tools consisted of a learning management plan, an assessment form for analytical thinking based on a model presentation, a learning outcome test, and a satisfaction assessment form, which passed the quality inspection by five experts. Data were analyzed by percentage, mean, standard deviation, dependent t-test, and one sample t-test. It was found that learning outcomes after learning were higher than before and higher than the 70 percent criteria. The students' critical thinking skills were at a very good level and higher than the 80 percent criterion. Overall, it was at a very agreeable level.

Keywords: Critical Thinking Skills, Game-Based Teaching Methods, Model-Based Learning

¹ Biology Program, Faculty of Education, Chiang Mai Rajabhat University, Chiang Mai 50300

² Department of Biology, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai 50300

* Corresponding author email: phitsanuphakhin_cha@cmru.ac.th

Mathematics learning management innovation using infographics and word walls for schools with teacher shortages

Taweedit Panyayong^{1,*}, Methasit Jaengklang¹, Thanawat Kheedkhin¹,
Ratchaneewan Sangpanya¹ and Phitchaon Fongda¹

Small schools are a structural problem that requires policies and operational plans from the central government to solve systematically. However, classroom teaching must be done before the central government can work. Therefore, schools must find a way to provide quality education to students with limitations. This research aimed to 1) develop mathematics learning management innovation using infographics and word walls for schools with teacher shortages and 2) study the results of using this innovation for students. The population studied included 33 Wat Hong Sung School students in the academic year 2021, and the research sample consisted of seven grade 5 students in the same school. The research tools used were 1) innovation prototype research tool, 2) context assessment research tool, and 3) impact assessment research tool. The research found that: 1) The components of the innovation consist of 2 parts: 1.1) an infographic, which is the process of summarizing knowledge into information for students to study on their own, and 1.2) a Word Wall program via QR-code, which is a game-like online test format. The innovation had an efficiency of 77.96/80.7. 2) The innovation results found that it can significantly improve students' academic progress at a statistically significant level of .05. There is a change in behavior in learning mathematics, in which most students have a positive behavior (85.71%).

Keywords: Infographic, Mathematics Learning Management Innovation, Schools with Teacher Shortages, Word wall

¹ Faculty of Education, Uttaradit Rajabhat University, Uttaradit 53000

* Corresponding author email: taweedit.mathedu.uru@gmail.com

**Development of 8th grade students' scientific argumentation skills through
argument-driven inquiry with higher order questions
in energy resources topic**

Thanyarat Suwannatrai^{1,*} and Theerapong Sangpradit²

The purposes of this study were to : (1) study the scientific argumentation skills of 8th grade students who learned through an argument-driven inquiry with higher order question in energy resources topic; (2) study the achievement in energy resources topic through an argument-driven inquiry with higher order question of 8th grade students. The participants in this study were 40 8th grade students who studied in the second semester of the 2022 academic year in a school in Samutprakarn, selected by convenience sampling. The research instruments consisted of five lesson plans, a scientific argumentation skills test, achievement test in energy resources topic and scientific argumentation skills behavior observation form. The data were analyzed using mean, percentage, standard deviation, cutting points and one samples t-test. The results showed that the argument-driven inquiry with higher order question in energy resources topic effects on scientific argumentation skills. The scientific argumentation skills of mean scores of the students after learning ($\bar{X} = 11.40$, S.D. = 2.52) was higher than those before learning ($\bar{X} = 7.18$, S.D. = 7.26) and mean scores of the scientific argumentation skills of the students were a statistically significant higher than the cutting point at a .05 level. There was a high level in overall scientific argumentation skills. In term of achievement, it found that achievement of mean scores of the students after learning ($\bar{X} = 22.25$, S.D. = 3.91) was higher than those before learning ($\bar{X} = 13.48$, S.D. = 2.26) and mean scores of an achievement of the students were a statistically significant higher than the cutting point at a .05 level.

Keywords: Argument-Driven Inquiry with Higher Order Question, Scientific Argumentation Skills

¹ Science Education, Science Education Center, Faculty of Science, Srinakharinwirot University

² Science Education Center, Faculty of Science, Srinakharinwirot University

* Corresponding author email: tanyarat.gngn@g.swu.ac.th

**A study on the effect of learning management of introduction to Data Science
Course with JARU Model for matthayomsuksa 4 students
of Satthasamut School**

Jaruwat Nakwimol^{1,*}

The aim of this study was to investigate the efficacy of the JARU Model in enhancing learning outcomes in the free elective subject MTH30231 Introduction to Data Science, offered to Matthayomsuksa 4 students following the Science-Mathematics study plan at Satthasamut School. This action research was conducted during the second semester of the academic year 2022, with a target group of 10 Mathayomsuksa 4 students enrolled in the course. The research employed three tools: (1) a learning management plan, (2) pre- and post-learning achievement tests, and (3) a questionnaire to assess attitudes towards learning. Basic statistics were used to analyze the data obtained. The results of the study can be summarized as follows:

1. The target group of students had an academic achievement rate of 70% in the course MTH30231 Introduction to Data Science, representing 80% of the total number of students. The mean score was 23.40 with a standard deviation of 3.47. When considering each learning unit, it was found that Unit 1: Data Science and Data Preparation had the highest academic achievement, followed by Unit 4: Data Visualization. Units 2 and 3, Descriptive Analysis and Diagnostic Analysis, and Predictive Analysis, respectively, showed good levels of academic achievement.
2. The target group demonstrated the highest level of positive attitude towards learning management and teachers, followed by learning media and innovation, curriculum and learning units, and learning support, respectively.

Keywords: Attitude towards Learning, Introduction to Data Science, Learning Achievement

¹ Department of Mathematics, Satthasamut School, Samutsongkhram Province

* Corresponding author email: jaruwat@sattha.ac.th

Investigating Thai eighth grade students' scientific problem - solving ability on global and national resource topics

Jirayute Ruennakarn^{1,*} and Chaninan Pruekpramool²

Problem-solving ability is an important skill for students, especially in science subject. Studying students' scientific problem-solving ability reflects their past learning experiences. The purpose of this research is to investigate the scientific problem-solving ability of Thai eighth grade students on the topic of Global and natural resources. The samples consisted of 150 eighth grade students from a school in Samutprakarn province, Thailand, who were studying in the second semester of the 2022 academic year using cluster random sampling. The research instrument was a multiple-choice scientific problem-solving ability test. The test composed of 5 situations and 20 questions covering 4 components of scientific problem-solving ability. The difficulty index of the test ranged from 0.32 to 0.81. While the discrimination power ranged from 0.26 to 0.75. The reliability of the test was 0.78. The data were analyzed using descriptive statistics including frequency, percentage, mean and standard deviation. The results indicated that students' scientific problem-solving ability mean score was at the moderate level ($\bar{X} = 11.98$, S.D. = 2.93). When considering each component, the results revealed that students scored highest in Identifying the problem ($\bar{X} = 3.36$, S.D. = 0.80) followed by Analyzing the cause of the problem ($\bar{X} = 3.10$, S.D. = 0.72), Verifying the solution ($\bar{X} = 2.85$ S.D. = 0.72) and Proposing-problem solving method and formulating a hypothesis ($\bar{X} = 2.67$, S.D. = 0.69), respectively.

Keywords: Eighth-Grade Students, Global and Natural Resources, Scientific Problem-Solving Ability

¹ Science Education, Science Education Center, Faculty of Science, Srinakharinwirot University

² Science Education Center, Faculty of Science, Srinakharinwirot University

* Corresponding author email: jirayute.toon@g.swu.ac.th

Studying a model of human eyes by adjustable liquid lens

Nathakorn Sutthiwan^{1,*}, Monsit Tanasittikosol² and Mayuree Hansupanusorn²

In this research, an adjustable liquid lens whose focal length is adjustable by changing the volume of the water within the lens was designed and constructed. The biconvex lens was made from two pieces of food preservation lids and an elastic sheet of polymer. The frame of the lens was made by connecting the lids on their rims which were sealed with a waterproof polymer sealant. To calibrate the lens, it is crucial to determine the relationship between the amount of water within the lens and the focal length. Three different techniques were used to find the focal length of the lens. In the first technique, the focal length was calculated using Lensmaker's equation based on the geometry of the lens. The focal length, in the second technique, was determined using the object and image distances. The last technique was calculated using the equation given in the Newtonian form. It was found that the focal lengths obtained from three different methods were in good agreement for a given volume of water. The polynomial equation of degree two was used to fit the data between the volume of water within the lens and the focal length. The data were strongly correlated with the value of R-squared of approximately 1.00. Therefore, it is suitable to be used to create a classroom demonstration set on the topic of human vision, including normal vision, hyperopia and myopia, was provided.

Keywords: Adjustable Liquid Lens, Farsightedness, Focal Length, Human Eyes Model, Nearsightedness

¹ M.Sc. (Physics Education), Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi Bangkok 10140

² Lecturer, Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi Bangkok 10140

* Corresponding author, email: nathakorn.sut@mail.kmutt.ac.th

The use of PhET interactive simulation in fundamental Physics laboratory: electromotive force and internal resistance

Chanwit Kamcharean^{1,*} and Kuanhathai Kuadnok²

The objectives of this research were: 1) to study the use of PhET interactive simulation in a fundamental physics laboratory to study electromotive force and internal resistance and 2) to gauge students' satisfaction as it pertains to use of PhET interactive simulation in a fundamental physics laboratory. The target group consisted of 40 freshmen enrolled in the Fundamental Physics for Health Science course in the second semester of 2022 academic year. The research instruments consisted of the PhET interactive simulation, which was accessible through the website, <https://phet.colorado.edu/en/simulations/circuit-construction-kit-dc-virtual-lab>, as well as the physics laboratory direction along with a satisfaction survey relating to the usefulness of PhET interactive simulation. The statistics for data analysis were percentage, average, and standard deviation. The research results found that PhET interactive simulation serves as a suitable tool in a fundamental physics laboratory. It enables students better understand the concepts of electromotive force and internal resistance. This is a convenient tool to utilize in a physics laboratory as it saves time for instructional media preparation and it does not require any costs. The satisfaction survey of the usefulness of PhET interactive simulation provided excellent feedback, which shows that PhET interactive simulation is a suitable tool to use in a fundamental physics laboratory.

Keywords: Electromotive Force, Internal Resistance, PhET Interactive Simulation, Physics Education Technology

¹ Department of Physics and General Science, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai, 50300

² Business English Program, Faculty of Humanities and Social Science, Chiang Mai Rajabhat University, Chiang Mai, 50300

* Corresponding author, email: chanwit_kam@cmru.ac.th

Simple apparatus for measuring speed of sound in air at various temperatures by frequency domain resonance tube

Adisorn Buranawong^{1,2} and Nirun Witit-anun^{1,2*}

Measurement of the speed of sound in air is one of the key topics in the physics of sound which can be measured in various methods. The object of this research was to construct a simple apparatus for measuring the speed of sound in air at various temperatures by frequency domain resonance tube. The results show that the constructed apparatus was composed of the resonance tube, speaker, microphone, heater, thermometer, computer, and sound frequency analysis program. The main concept of the constructed apparatus was to input the white noise from the speaker into a resonance tube, the resonance with different modes was created in the tube, which was formed by the interference of incidence sound wave from the speaker and reflected sound wave in the tube. The resonance frequency (f_n) in the tube with the length of L corresponded to the speed of sound (v) and harmonic number (n) according to $f_n = (v/2L) n$. The speed of sound in air at room temperature which is measured by the constructed apparatus was in the range of 280.4 – 335.2 m/s with an error in the range of 3.1 - 19.0%, and the equation of the speed of sound in the air, from the simple apparatus in this research work, was $v = 336.15 + 0.54t$.

Keywords: Frequency Domain, Physics of Sound, Resonance Tube, Speed of Sound

¹Physics Education Research Group@Bangsean, Department of Physics, Faculty of Sciences, Burapha University, Chonburi

²Thailand Center of Excellence in Physics (ThEP), Ministry of Higher Education, Science, Research and Innovation (MHESI)

*Corresponding author, email: nirun@buu.ac.th

Current trends toward enhancing scientific literacy

Natdanai Nirutmeteeekul^{1,*} , Thodsaporn Thongyoo¹ , Kannika Chanthaphim¹ ,
Kanchana Thongprachum¹ and Suppamai Promkaew¹

The review aims to examine current trends of research on toward enhancing scientific literacy in Journal Research in Science Education between 2018-2022. The systemic review was used to identify and categorize the content of articles. In total, 107 recent studies were selected, all referring to toward enhancing scientific literacy. The collected data was analyzed by the used of frequency, percentage and content analysis. Systemic analyses showed that publications by authors from USA were most dominant. Many of studies focused on student. The study indicates that strategies was most found in the study especially using teaching models. However, the implication of this study will be guidelines in toward enhancing scientific literacy and also predict the future research in these areas.

Keywords: Current trends, Science Education, Toward enhancing scientific literacy

¹ Faculty of Education, Valaya Alongkorn Rajabhat University Under the Royal Patronage Pathumthani, 12120

* Corresponding author email: natdanai.ni@vru.ac.th

**Relationship between behavior and food consumption knowledge according to
nutrition principles of exercise science and sports students
University of Phayao**

Pranee U-siri^{1,*}, Kamonthip Inprom¹ and Phatcharaporn Wongchai¹

The study of food consumption behavior aims to study the level of knowledge of food consumption and the relationship between behavior and knowledge of food consumption according to nutrition. The samples were selected from the sophomore Exercise and Sport Science students at the University of Phayao. The 72 samples were drawn using a purposive sampling method. The instruments used were questionnaires. Data were analysed by using the frequency, mean, percentage Standard Deviation and Pearson's correlation coefficient. The findings indicated that the students had food consumption behavior. The overall picture was at a good level ($\bar{x} = 2.73$). The students had a good knowledge of food consumption according to nutrition, accounting for 70.83 percent and the relationship between behavior and knowledge of food consumption according to nutrition. It was found that there was a positive correlation of .032 at a low with not statistically significant at 0.05 level. Students who knew about food consumption of goodwill had attitudes and food consumption behavior according to good.

Keywords: Food Consumption Behavior, Level Knowledge Food Consumption According to Nutrition, Sophomore Exercise and Sport Science Students

¹ Exercise and Sport Science, School of Science, University of Phayao 56000

* Corresponding author email: pranee.us@up.ac.th

Offensive patterns analysis of Thai nation team in volleyball women's nations league 2022

Suriyon Luangtrongkit^{1,*} and K.Ravivuth Rangubhet¹

Proper offensive form in volleyball is important for athletes. Because it can attack quickly and violently. Able to hit the ball in the desired position without error. The purpose of this research was to study and compare the offensive patterns and the result of the offensive of the Thai national team and the opponent's team in the Volleyball Women's Nations League 2022 between May 31 and July 14, 2022, 13 matches, 51 sets, divided into 3,151 offensive data analyses, 3,151 results of the offensive data analyses, and analysis of offensive patterns and results. Match-by match comparison using the average standard deviation, percentage, and t-test analysis statistics. The Thai national team uses the most offensive patterns with Outside Spiker (C) (10.31 ± 3.43), accounting for 37.44 percent per match. and 3, the patterns of the offense were significantly different at the 0.05 level, namely the back-row offense (3m) (24.38 ± 8.00), representing 20.01 percent per match. Fast forward to offensive (A) (10.31 ± 3.43), representing 8.46 percent per match, and combination play (X) (6.23 ± 3.81), representing 5.11 percent per match. As for the offense results, it was found that the offense scored (Ace) (35.08 ± 10.75) representing 33.40 percent per match. And by comparing the results of the offenses of the Thai national team and the opponent team. It was found that there was no significant difference in the average results of offense error (Error), offense blocked (Block Kill), an offense can counter-offensive (Continue), offense blocked and able to offensive again (Block & Hit), offensive the ball so as not to lose a score (Free ball), the offense cannot continue playing (Touch ball) and offense scored (Ace) between the Thai national team and the opponent team. Statistics at level 0.05.

Keywords: Offensive patterns, Performance analysis, Volleyball

¹ Exercise and Sport Science, School of Science, University of Phayao 56000

* Corresponding author email: suriyon.koe@gmail.com

Oral Presentation

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์
เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

Development of dashboard for the satisfaction assessment

Apichai Suesatsakulchai¹, Wanchana Choobanjong² and Namida Suesatsakulchai^{1,*}

Nowadays, the Google Form is a widespread online questionnaire tool. The dashboard feature is a basic summary of submitted data from the questionnaire, but it may not sufficient for the user's needs. The purpose of this article is to build a dashboard for satisfaction assessment. The data manipulation from Google forms followed the extraction-transformation-loading (ETL) process for a dashboard data source. Simultaneously, a dashboard was created. A dashboard has three sections. Firstly, filtering data. Secondly, displaying overall satisfaction assessment results. Lastly, displaying satisfaction assessment results in each section of the questionnaire. A dashboard use evaluation from the user shows that the users were satisfied at a high level of satisfaction. A dashboard displays complete information. Moreover, it reduces the time and operation of summarizing information from raw data. This study can apply to the automation of data manipulation from other online questionnaires to data sources or data analytics.

Keywords: Dashboard, Google Data Studio, Google Form

¹ Faculty of Business Administration and Liberal Arts, Rajamangala University of Technology Lanna Tak

² Faculty of Science and Agricultural Technology, Rajamangala University of Technology Lanna Tak

*Corresponding author, email: namida_nong@hotmail.com

A development of DVe-Sar system to report self assessment results for department level at Chiang Rai vocational college

Piyamas Kaewinta^{1,*}, Kaewarin Jandum² and Sitthidet Vachirasricirikul³

A DVe-Sar system is a report and an assessment system for a department in a vocational college which is used for educational quality assurance. The researchers design the DVe-Sar system by using system development life cycle (SDLC) and the DVe-Sar system is evaluated by users. Also, the questionnaires are evaluated by experts. The sample group of this study consists of 87 administrators and teachers at Chiang Rai Vocational College. The results of evaluating the satisfaction show that the used functions of system have high level and mean of 4.47, the program usability has high level and mean of 4.57, and the security has high level and mean of 4.56, All results of the DVe-Sar system have high effectiveness level and mean of 4.51, S.D. of 0.66 and the system is implemented in Chiang Rai Vocational College.

Keywords: Educational Quality Assurance, Information System

¹ Department of Modern Information Technology Management, School of Information and Communication Technology, University of Phayao

² Department of Digital Business, School of Information and Communication Technology, University of Phayao

³ Department of Electrical Engineering, School of Engineering, University of Phayao

*Corresponding author, email: 62023430@up.ac.th

A team-member recommendation system to assigned tasks using analytic hierarchy process

Nguyen Hoang Anh¹ and Duangduen Asavasuthirakul^{1,*}

Assigning tasks to team members that their qualifications match job requirements is one of the most challenging tasks that organizational executives or leaders usually face. However, due to many limitations, such as a short decision time frame, incomplete or outdated information about team members, may cause the executives to consider assigning tasks inappropriately. This research proposes the idea of applying the analytic hierarchy process (AHP) in selecting team members who are suitable for the assigned task, with the case study of university administrators. The proposed AHP model composes of two main factors: expertise and workload. Expertise is determined by each member's abilities or skills in various fields, consisting of five sub-factors: research, IT, academic service, art and culture, and management. As for the workload, it is considered from various responsibilities or current/planned workloads, consisting of six sub-factors: teaching, meeting, research, academic service, art and culture, and administrative work. The proposed AHP model is implemented as a web application to enable team members to enter their expertise and workload through the system. Meanwhile, executives can create tasks that they want to delegate. The system processes the relevant information and recommends a list of team members suitable for the assigning task sorted by the weight calculated from the AHP model. This will facilitate executives to assign tasks efficiently in real-time.

Keywords: Analytic Hierarchy Process, Assigned Task, Decision Support System, Personnel

¹ Department of Computer Science and Information Technology, Faculty of Science, Naresuan University

*Corresponding author, email: duangduenr@nu.ac.th

Information system for COVID-19 infected students in Naresuan University Secondary Demonstration School

Chonnakarn Wongnim^{1,*}, Ratiwat Phitpatsart¹ and Nithirat Sisarat¹

Since the beginning of the outbreak until now The COVID-19 virus cause problems for people continuously.especially within a school .Students infected with COVID-19 unable to come to school as normal. Some teachers don't know that students are absent. And when they make attendance check or make appointments for students to do activities, it may cause inconvenience in tracking information of infected students. The Researchers have the idea to create an Information System that manage the information of Students infected with COVID-19 using Google Forms to use as a channel to request information from the students ,Use Google Sheet to collect the information that has been inquired and keep the information for statistical purposes, and Using the Google App Script and Line developers working together to create a Line bot that works in the Line Official Account so that infected students can send their own information in the form of notification from the Line application to the teachers. The scope of testing and development is that students are in m.4.6, m.4.7 and mathematics teachers of Naresuan University Secondary Demonstration School. When analyzing problems, planning work, writing programs, and testing the program until the process finished. Teachers and students in grade 4.6 and grade 4.7 There are suggestions to add more functionalities.

Keywords: COVID-19, Google App Script, Google Form, System

¹ Highschool,Naresuan University Secondary Demonstration School, 65000

*Corresponding author email: chonnakarnw65@nu.ac.th

Information system development for management of small distilled liquor factories of Phayao area excise office

Sivapriya Prasertsung^{1,*}, Kaewarin Jandum¹ and Sitthidet Vachirasricirikul²

The objectives of this research are to analyze and design the information management system of the small distilled liquor factories of Phayao area excise office, and also to evaluate the quality of the system. For the research results, it is found that 1) with the results of system analysis and design for information management of small distilled liquor factories of Phayao area excise office, there are 3 tables of data imported to database, create a map showing the location of the factories, create 2 graphs and 3 tables of tax payment report by factories, create report of factories that do not pay tax and create factories visit reports, and 2) the quality evaluation of the information management system for facilitation is very good level (Mean = 4.58, S.D. = 0.61), the ease of understanding to display data is good level (Mean = 4.50, S.D. = 0.71), the benefits to administrations are good level (Mean = 4.42, S.D. = 0.78) and the overall quality in all cases is good level (Mean 4.50, S.D. = 0.70).

Keywords: Management Information System, System Analysis and Design, Small Distilled Liquor Factories

¹ School of Information and Communication Technology, University of Phayao

² School of Engineering, University of Phayao

*Corresponding author, email: sivapriya@excise.go.th

Hybrid-dimension association rule and customer clustering: case study in construction business

Chairoj Lorpaiboon¹ and Wirat Jareevongpiboon^{1,*}

This research target is studying the modeling of association rules of shopping data in different categories and segment customers by purchasing behavior. Using the principle of RFM Model and use to results of this study were used to search for the pattern of purchasing in the construction business by Hybrid-dimension association rules and linking customers from segmentation. The association rules to launch campaigns for specific groups. The dataset has 12,639 transactions from a database of retail stores from February 2022 to February 2023 and it has 12 characteristics. The design of this research was using Python. It is used for preprocessing, find association rules using the FP-Growth, find clusters of data and analyze and group customers from the data with RFM and K-Means. The result of research is 1) a study of shopping behavior patterns from the retail store data. It was found that the total number of buying behavior patterns were 112 relationship rules. When setting the minimum support equal to 0.01 and selecting the 5 correlation rules that have the highest confidence to be used to consider the promotion, it is found that the correlation rules have a confidence value of 71% - 83% 2) Customer segmentation using K-Means using RFM data analysis resulted in 3 segments of customers. 3) Results from the Hybrid-Dimension Association Rules between the relationship rules and customer groups found that the groups 2 and 3 who buy electrical equipment and lamps tend to buy cleaning equipment with 71% confidence and have a chance of buy up to 5.88 times the probability of buying, buy computer equipment and plumbing equipment, often buy electrical equipment with 71% confidence and 3.87 times the probability of buying, the second group who buy tools and electrical and plumbing equipment are more likely to buy computer equipment with 83% confidence and 8.7 times the probability of buying, who buy tools and lamps tend to buy electrical equipment with 83% confidence and 4.51 times the probability of buying, who buy plumbing and computer equipment purchasers tend to buy tools and electrical equipment with 71% Confidence and 10.54 times.

Keywords: Association Rule, Market Basket Analysis, Unsupervised Learning

¹ Faculty of Science and Technology, Thammasat University

*Corresponding author email: wirat@tu.ac.th

Multi-scenario satellite drought assessment using moisture stress index (MSI) in Mae Suk watershed, Mae Chai district, Phayao Province

Siriwan Ruenrom¹ and Niti lamchuen^{2,*}

Drought is a natural disaster that has occurred for a long time from the past to the present. And it can happen in every area. Droughts are often caused by changes in rainfall. That is, the amount of rain is lower than usual for a long time, affecting agricultural productivity. Current drought conditions can be assessed from the drought index calculated using a remote sensing technique, using the Moisture Stress Index (MSI) to analyze drought risk areas affecting land use. In this study, the objectives of this research are (1) to find drought areas in 3 scenarios from rainfall data for a 30-year period (1998, 2001 and 2015). namely the high rainfall year (2001), normal rainfall year (1998), and low rainfall year (2015). (2) to investigate areas at risk of drought that affect current land use. The results showed that drought areas (moderate drought, severe drought, and extreme drought) were also present in all three scenarios with an area of 10,193 rai (low rainfall year), 13,654 rai (normal rainfall year), and 5,736 rai (high rainfall year). The land use pattern was found that of various activities. There were different drought indices: agricultural area (0.6 – 1.9), forest area (0.4 – 1.4), miscellaneous area (0.6 – 1.9), urban area and buildings (0.6 – 1.4), and water resource area. (0.4 – 1.6). The MSI index can indicate the severity of drought and help in making decisions support related to water management and land use.

Keywords: Land use, Moisture Stress Index, Phayao, Remote sensing, Upper Ing watershed

¹ School of Information and Communication Technology, University of Phayao, Phayao Province

² Department of Geoinformatics Faculty of Information and Communication Technology University of Phayao

*Corresponding author email: niti018@hotmail.com

A comparison of the accuracy of aerial imagery maps obtained from small unmanned aerial vehicles at various altitudes

Phanu Uthaisri^{1,*}, Jakkrit Suwanmongkol¹, Chanon Porjai¹ and Nuttanun Phromwan¹

In several units, the use of small unmanned aerial vehicles for aerial mapping has grown in popularity. One of the flight planning designs is the flying height. The accuracy of aerial photographic maps from small unmanned aerial vehicles is compared in this study to assess the errors that would arise with aerial imagery mapping using small unmanned aerial vehicles at different altitudes. The test heights were 100, 120, 140, 160, 180, and 200 meters, with 5 ground image control points and 20 validation points distributed around the area. The study found that aerial map from small unmanned aerial vehicles at various heights had errors of 100 aberrations. 120, 140, 160, 180, and 200 meters are equivalent to 4.497 centimeters, 4.009 centimeters, 5.650 centimeters, 6.231 centimeters, 6.861 centimeters, and 6.585 centimeters, respectively. It can be seen that as the height increases, the tolerances increase significantly.

Keywords: Aerial Photogrammetry, Drone, Error, Unmanned Aerial Vehicle

¹ Department of Civil Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna, Chiang Mai, 50300

*Corresponding author email: u_phanu@yahoo.com

Design of a controlled wheelchair with smart wearable device using gyroscope sensor for assisting people with disabilities

Napat Menichai¹, Kanit Meaungsong¹, Grit Tongkhundam² and Napat Keawpibal^{2*}

The number of people with disabilities has been increasing in recent years, either due to accidents or being born with disabilities. Despite being able to travel on their own, there are limitations based on factors such as their strength and weight. This research focuses on designing and developing a wheelchair and wearable device that utilizes a gyroscope sensor and is connected via Bluetooth, allowing people with disabilities to travel more conveniently. Gesture recognition is achieved by analyzing the values from the MPU6050 gyroscope sensor, where movements to the left and right are represented by the x-axis and movements forward and backward by the y-axis. An evaluation was conducted to measure the device's delay time for data transmission via Bluetooth. The results indicated an average delay of 46.8 milliseconds for each gesture change, including forward, backward, left turn, right turn, and stop. The distance between the two ESP32s was approximately 0.6 meters.

Keywords: Gyroscope Sensor and Disabled Person, Wearable Device, Wheelchair

¹ Science Classrooms in University – Affiliated School, Thaksin University, Phatthalung, 93210

² Department of Computer and Information Technology of Science, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author email: napat.k@tsu.ac.th

Medical appointment scheduling software using Q care application for clinics

Pannathat Kantangkul^{1,*}, Teerapat Vatpitak¹, Grit Tongkhundam² and Naphat Keawpibal²

This paper presents Medical Appointment Scheduling Software using Queue Care Application for Clinics. The aim of this study was to develop a mobile-based reservation queue for clinic appointments. The SDLC (Software Development Life Cycle) approach was used to be the software development process of this work. The mobile application is developed using Flutter code in Visual Studio code with DART language. There are four main functions consist of 1) registration 2) search 3) reservation and 4) display queue. In the future, the application can be improved by incorporating AI technology to enhance the search function and potentially be expanded to include hospital appointments as well.

Keywords: Application, Appointment, Clinic, IoT, Queue

¹ SCiUS - TSU, Paphayompittayakom School, Phatthalung, 93210

² Department of Computer and Information Technology, faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author email: 14097@tsu.ac.th

Development of mobile application for tracking medications of elderly patients

Pongsarit Katekeaw^{1,*}, Thitirat Meesawat², Noppamas Pukkhem² and Naphat Keawpiba²

The problem of forgetting to take the patient's medication has a significant impact on the treatment process, as it will reduce the effectiveness of the drug, causing more time and money to be wasted. It led to the development of a patient medication tracking application This will facilitate data recording conveniently. It is fast and able to show the medication history of elderly patients. This allows the treating physician to evaluate the treatment effectively. In conducting research on the development of a medication tracking system for elderly patients There is a core development process in the form of SDLC (Software Development Life Cycle), which is a popular methodology for quality software development processes. The details of how to proceed are as follows: feasibility study for system development in studying the feasibility of system development A study will be conducted on various issues, including how to track the patient's medication intake in general. technology for system development User groups and contributors for action. The developed application uses the Dart programming language to improve the function of the system divided by 1. Section 2. Reminder to take medicine. Medication Part 3, Drug Information Section. After developing the system until it is confident in its actual use There must be a test run of the system. to check and fix possible errors This makes the system complete and able to do it accurately and precisely.

Keywords: Elderly, Medication Tracking System, Mobile Application

¹ Science Classrooms in University – Affiliated School, Thaksin University, Phatthalung, 93210

² Department of Computer and Information Technology of Science, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author email: 14100@tsu.ac.th

Automatic flower detection for some orchid identification using convolution neural networks

Siriwimon Mo-In¹, Patcharee Maneerat² and Pisit Nakjai^{2,*}

This study presents the performance of orchid detection and classification using Convolutional Neural Networks (CNNs). Specifically, YOLOv5 model, which is an object detection technique based on CNN, was utilized for identifying and categorizing orchids within images. The YOLO technique was employed in this research to accurately identify and classify six different types of orchids that may be present in the images. In this study, there are 350 images, including the training dataset of 281 images and the test dataset of 69 images. These images are trained and tested in three models (Yolov5s, Yolov5n and Yolov5t). Additionally, to ensure a generalized model, K-Fold cross-validation was employed to prevent overfitting with the training dataset. Experimental results show that the Yolov5s model has outperformed with the mAP of 0.794. The Yolov5n and Yolov5t models achieved the mAPs of 0.737 and 0.729, respectively.

Keywords: Convolution Neural Network, Mean Average Precision, Objection Detection, Orchid, YOLO

¹ Programme in Computer Science, Faculty of Science and Technology, Uttaradit Rajabhat University

² Programme in Data Science, Faculty of Science and Technology, Uttaradit Rajabhat University

*Corresponding author email: pisit.nak@uru.ac.th

Comparison of classification models performance with financial data

Praifa Kosasirisin¹, Anamai Na-udom^{1,*} and Jaratsri Rungrattanaubol²

The objective of this research is to study the process and compare the performance of classification models on financial datasets. There are 3 classification techniques used here as follows: binary logistic regression, classification and regression tree and naïve bayes, and using 3 financial datasets with different numbers of qualitative and quantitative independent variables. The research begins by constructing a classification model that divides the training dataset and the test dataset with a cross-validation method with a value of k equal to 5 (5-Fold Cross-Validation) and then test the performance on the test data with accuracy and balanced accuracy. The results show that binary logistic regression is the best performance on datasets with a number of qualitative equal to quantitative independent variables, which has a balanced accuracy of 59.84%. In the part of classification and regression tree technique is the best performance on datasets with a number of qualitative less than quantitative independent variables, which has a balanced accuracy of 81.96%. And naïve bayes technique is the best performance on datasets with a number of qualitative more than quantitative independent variables, which has a balanced accuracy of 69.60%. The classification model can be applied in predictions risks that may occur to the bank.

Keywords: Binary Logistic Regression, Classification and Regression Tree, Financial Data, Naïve Bayes

¹ Department of Mathematics, Faculty of Science, Naresuan University

² Department of Computer Science and Information Technology, Faculty of Science, Naresuan University

*Corresponding author, email: anamain@nu.ac.th

Face emotion classification of human using convolutional neural network technique of deep learning

Chareewal Klomklom¹ and Sutasinee Jitanan^{1,*}

Emotions are the expressions of human when be stimulated from internal and external stimuli. Human emotions can observe through facial expressions, tone of voice, and gestures. The conversation partner or co-worker can recognize emotions and respond appropriately to facilitate working or living together. Therefore, this research aims to develop a model using Convolutional Neural Networks(CNN) for emotional classification. This model able to classify four basic human emotions such as anger, happiness, sadness, and neutrality. These emotion classes are applied to positive emotions that consist of happiness and neutrality. Negative emotions consist of anger and sadness. In the study, three architectures were used in the experiment: VGG16, EfficienNetV2B1, and MobileNetV2. The experimental results on the dataset showed that the VGG16 model with augmented images of the dataset had the highest accuracy of 85.00%. The EfficienNetV2B1 and MobileNetV2 model with augmented images had accuracy of 84.92% and 83.83% respectively. Therefore, this research can be concluded that the model developed using VGG16 architecture with augmented images is effective for emotion classification. The model can be applied to classify student emotions for on-demand learning. Emotions will be summarized at various periods after the end of the course further improvement of teaching.

Keywords: Artificial Intelligence, Convolutional Network, Deep Learning, Face Emotion Classification

¹ Department of Computer science and Information Technology Faculty of Science Naresuan University 65000

*Corresponding author, email: sutasineec@nu.ac.th

Automatic attendance system with facial recognition

Jeerabhat Supapinit¹ and Aukrit natkhaeo^{2,*}

Nowadays, technology and innovation play a critical role in improving daily life and solving problems. One such problem in the educational field is the attendance verification process, which can be time-consuming and inconvenient. To address this issue, the authors propose a solution using facial recognition technology to automate the process and reduce manual methods such as student ID cards or hand checks. The proposed system aims to design and implement a user-friendly, highly accurate, and practical automatic attendance system. The system will detect faces, recognize them, and compare them with a database to confirm identity. It will also be capable of recognizing new faces automatically, making it suitable for organizations and educational institutions. The system consists of a webserver, cloud storage, a real-time database, and a Raspberry Pi as a worker. To evaluate its capability, the system will undergo accuracy testing and load testing. In the competency assessment, this system was tested by the accuracy and load testing. It can be shown that the best accuracy for facial recognition occurs at rotation with 0° around the Y-axis and 0° around the X-axis for precision testing over various distances. The system has the highest accuracy when there is a range of less than 4 meters in standard resolution and 16 meters in high resolution. In addition, load tests have shown that the system can accommodate up to 9 people with the right frames per second.

Keywords: Computer vision, Face detection, Facial recognition, Machine learning, Raspberry Pi

¹ Piboonbumpen Demonstration School, Burapha University

² Science Classrooms in University-Affiliated School Project, Science Burapha University

*Corresponding author, email: aukrit.na@buu.ac.th

Oral Presentation

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์
และวัสดุศาสตร์

Effect of source-to-substrate distance on radial distribution of TA-C films in filtered cathodic arc discharge

Nanthapat Chanapai¹, Phitsanu Poolcharuansi^{1,*} and Nopphon Saowiang²

The objective of this study is to investigate the impact of the source-to-substrate distance on the radial distributions of tetrahedral amorphous carbon (ta-C) films on silicon strips, using the pulsed-filtered cathodic arc deposition technique. To characterize the thin films, several techniques were employed, including ellipsometry, X-ray reflectometry (XRR), and Raman spectroscopy. The results indicate that the thickness distribution for a given source-to-substrate distance is characterized by a Gaussian-like profile. The intensity, peak position, and width of the thickness profile show progressive changes with increasing source-to-substrate distance, primarily due to plasma expansion mechanism in vacuum. As a result, the dependency of the thickness profiles can significantly affect the structure and properties of the deposited films. The Raman spectra show that the I_D/I_G ratio is lowest at the peak profile, while a further increase in the source-to-substrate distance causes the I_D/I_G ratio to shift to a higher value. These findings are in good agreement with the film density distribution obtained by the XRR technique.

Keywords: Pulsed-filtered cathodic vacuum arc technique, Tetrahedral amorphous carbon film, Thickness distribution

¹ Department of Physics, Faculty of Science, Maharakham University, Maharakham, 44150

² Technological Plasma Research Unit, Maharakham University, Maharakham, 44150

*Corresponding author email: phitsanu.p@msu.ac.th

Temperature dependence of AC electrical properties in graphitic carbon nitride compact

Tosapol Maluangnont^{1,*}

Graphitic carbon nitride has emerged as a re-discovered two-dimensional (2D) material with potential applications in catalysis, sensors, electronics, and so on. However, most studies focus on its properties at ambient conditions only, leaving the gap in our understanding of its behavior at elevated temperature. In this presentation, the alternating current (AC) electrical properties of graphitic carbon nitride will be reported from room temperature to 400 °C and back to temperature. The hysteresis at ambient condition is observed and ascribed to the contribution from atmospheric water. Otherwise, graphitic carbon nitride shows a relatively stable impedance, conductivity, dielectric permittivity, and dielectric loss, compared to an ion conductor such as $K_2Ti_4O_9$ or a dielectric/ferroelectric ceramic such as BNT-BT ($0.93Bi_{0.5}Na_{0.5}TiO_3-0.07BaTiO_3$). The sample was characterized by X-ray diffraction, thermogravimetric analysis, infrared spectroscopy, transmission electron microscopy, and solid state 1H nuclear magnetic resonance spectroscopy.

Keywords: Graphitic carbon nitride, Impedance spectroscopy, Temperature dependence

¹ College of Materials Innovation and Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520

* Corresponding author email: tosapol.ma@kmitl.ac.th

The effect of different functional monomer of zirconia primer and universal adhesive on shear bond strength of zirconia to composite resin using resin cement

Pimchanok Pitakassawakul^{1,*} and Pravej Serichetaphongse²

Zirconia has been increasing used due to its good mechanical properties but the study about the ability to bond to zirconia ceramic is still limited. The aim of this study is to evaluate the bond strength of zirconia using MDP-containing zirconia primer and GPDM-containing universal adhesive. Fifteen super-high translucent zirconia discs (Ceramil zolid fx White; AMANN GIRRBACH, Austria), 8.5 mm in diameter and 3.2 mm in thickness, were prepared. The specimens were divided into 3 groups (n=5) according to primer application, Group I: no primer application (control group), Group II: Z-Prime plus® (Bisco, Schaumburg, Illinois, USA) and Group III: Optibond universal® (Kerr Corporation, California, USA). After each primer was applied, they were cemented to resin composite discs (Tetric N-Ceram, Ivoclar Vivadent), 3 mm in diameter and 2 mm in thickness, using resin cement(NX3, Kerr Corporation, California, USA). After thermocycling, the shear bond strength test was performed using the universal testing machine (EZ-S, SHIMADZU, Japan) and failure modes were examined. Data will be analyzed with one-way ANOVA and post hoc Tukey test ($\alpha=0.05$). The surface treatments significantly affected the shear bond strength between zirconia and resin composite. The Z-Prime plus group showed highest shear bond strength (23.35 ± 1.32 MPa), followed by group of Optibond universal (14.23 ± 0.94 MPa), and control group (6.18 ± 0.34 MPa). The MDP-containing zirconia primer groups showed significantly higher bond strength than GPDM-containing universal adhesive group.

Keywords : Resin cement , Shear bond strength, Universal adhesive , Zirconia, Zirconia primer ,

¹Department of Prosthodontics, Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand

² Department of Prosthodontics, Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand

*Corresponding author email: miracle.title@gmail.com

Effect of potassium oleate on X-ray attenuation properties of natural rubber/barium sulfate composite

Nisamon Thongham¹, Suwit Pethauylung¹, Pornpana Buaphet¹, Narit Klompong²
and Sutthisa Konruang^{1*}

The purpose of this research was to study the effect of potassium oleate on the X-ray attenuation properties of natural rubber composites mixed with barium sulphate. The amount of barium sulfate 0 - 100 phr was used and the density and X-ray attenuation properties were studied. The results showed that increasing the barium sulfate content increased the density value. The maximum density obtained from samples prepared from 100 phr barium sulfate was 0.45 g/cm³ when potassium oleate was added and 0.7 g/cm³ when potassium oleate was not added. In addition, the test results showed that with increasing barium sulfate dosage, the linear radiation attenuation coefficient increased. The mass absorption coefficient of the potassium oleate-added natural rubber foam composite sheet was the highest at the barium sulfate content of 50 phr for the non-potassium oleate-added natural rubber foam composite sheet. When the barium sulfate content was 100 phr, while the half-thickness decreased with increasing barium sulfate. and the minimum half-thickness when adding 100 phr of barium sulfate for both potassium oleate- and un-added samples.

Keywords : Barium sulfate, Natural rubber composite, Potassium oleate, X-ray

¹ Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93210, Thailand

² Department of General Education, Faculty of Science and Fisheries Technology, Rajamangala University of Technology Srivijaya, Trang, 92150, Thailand

Corresponding author email: Sutthisa@tsu.ac.th

Study of kinuta glaze is recycling silica from glass beer bottle

Nattawut Ariyajinno^{1,2,*}

These research study Kinuta glaze is cracking from glass beer bottle select two samples of the beer bottle Blue is green and brown by observing the results after burning study the physical properties of Kinuta glaze temperature 1,250 °C reduction and study the changing physical properties of the broken glass can be observed with the naked eye after burning for use in decorating ceramics products From the experimental results, it was found that In the temperature range 1,250 °C The glass scraps melting well and glaze is cracking from glass beer bottle Blue is green and brown The experimental results of using glass scraps from beer bottles As a result, it can be used to decorate ceramics products, Recycling silica especially in the form of cracking glazed cracking for the Japanese glaze Kinuta glaze.

Keywords: Ceramic Glaze, Cracking, Glass Beer Bottle, Kinuta glaze, Recycling

1Department of Management Engineering, Faculty of Industrial, Loei Rajabhat University, Loei, 42000, Thailand

2Department of Ceramics Technology, Industrial Faculty of Technology, Loei Rajabhat University, Loei, 42000, Thailand

*Corresponding author e-mail address: Nattawut.ari@lru.ac.th

Influence of formic acid concentration on properties of rubber ribbed smoked sheet

Saisunee Jitkla^{1*}, Kanok Boonkerd² and Sirilux Poompradub³

This research studied the effect of formic acid concentration used in latex coagulation on the physical properties of rubber ribbed smoked sheet (RSS) and the mechanical properties of the obtained vulcanized rubber. The concentrations of formic acid used were 2%, 3%, 4%, 5%, 8% and 10%w/v. After the rubber was coagulated, it was sheeted and dried by a smoking process. From the test results, it was found that Mooney viscosity, Po and PRI of the RSS decreased with increasing the formic acid concentration, while the ash and nitrogen did not change insignificantly but volatile contents obviously increased with increasing the formic acid concentration. Rubber compounds prepared from the RSS using high formic acid concentration in coagulation showed a slightly slower curing reaction. This is because the acid used to coagulate the rubber may remain in the rubber. Generally, the acid is a retarder for vulcanization. Vulcanized rubber obtained by using formic acid at 2%, 3% and 4% w/v in coagulating latex had similar tensile strength. However, when further increasing formic acid concentration, it was found that the vulcanized rubber had higher tensile strength. When considering the elongation at break, it was found that the vulcanized rubber obtained by coagulating with formic acid concentration at 5% w/v had the highest elongation at break. It can be concluded that the concentration of formic acid used to coagulate latex for preparing the RSS effected the physical properties of RSS and the mechanical properties of RSS vulcanizate. Therefore, in the preparation of RSS with a consistency of properties, the concentration of formic acid must be controlled to be constant.

Keywords: Curing properties, Formic acid, Mechanical properties, Physical properties, Ribbed smoked sheet (RSS)

¹Department of science for industry, Faculty of science, Chulalongkorn university, Bangkok, 10330

²Department of materials science, Faculty of science, Chulalongkorn university, Bangkok, 10330

³Department of chemical technology, Faculty of science, Chulalongkorn university, Bangkok, 10330

*Corresponding author, email: suysunee2589@gmail.com

Integrating phase change materials to the SHERA wood wall for improving the efficiency of heat transmission reduction

Dachaphon Kealkaew¹ and Atthakorn Thongtha^{1,*}

The application of SHERA woods wall integrating with phase change materials (PCMs) was studied in this work to reduce heat transmission into building frame. Phase change materials (PCMs) are the melting point of around 55°C (PCM 1) and 45°C (PCM 2). The testing model with a dimension of 60 cm x 60 cm x 60 cm was designed to test the thermal transmission in each condition which was such as 1) SHERA wood without PCM 2) PCM layer underneath the SHERA wood surface 3) PCM layer between SHERA wood and gypsum layer 4) PCM layer above SHERA wood surface. All samples were tested and constantly controlled at the ambient temperatures of 40°C, 50°C, and 60°C for 240 min. It was found that the installation of PCM position between the layer of the SHERA wood and gypsum can decrease the maximum heat transmission from exterior space to interior space of model up to approximately 5.9%, 9.3%, and 11.1% when compared with the SHERA wall without PCM at the controlled temperatures of 40°C, 50°C, and 60°C, respectively.

Keyword : Heat transfer reduction, Phase change materials, SHERA wood, Thermal insulation material

¹Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: atthakornt@nu.ac.th

Study of production of 5-Hydroxymethylfurfural from corn cobs by dehydration reaction using formic acid and sodium hydroxide as reagents

Nattapon Kongwattana¹, Kaokanya Sudprasert^{1,*} and Chakrit Tachaapaikoon²

5-Hydroxymethylfurfural is an organic compound, that can be synthesized by dehydration of fructose or glucose. The 5-hydroxymethylfurfural platform can be converted into bioliquid fuels and many chemicals. This research studies the synthesis of 5-hydroxymethylfurfural from corn cobs using co-catalysts. The co-catalysts contain formic acid and sulfuric acid in water and 80% acetonitrile, testing at 140 and 160 °C. The results of using co-catalysts show the best condition for yield 3.5% at ratio of 0.2 M formic acid to 0.2 M sulfuric acid in 80% acetonitrile at 140 °C for 45 min. Subsequently, formic acid and sodium hydroxide are used as reagents. The condition from the best condition of the co-catalyst test including the ratio of 0.2 M formic acid to 0.2 M sodium hydroxide at 140 °C for 45 min in water is found and the yield of 78% can be achieved, which is the highest yield in this research.

Keywords: 5-hydroxymethylfurfural, Corn cobs, Dehydration, Formic acid, Sodium hydroxide

¹ School of Energy, Environment and Materials, King Mongkut's University of Technology Thonburi, 126 Pracha Uthit Rd., Bang Mod, Thung Khru, Bangkok, 10140

² School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, 10150

* Corresponding author email: kaokanya.sud@kmutt.ac.th

Investigation of fire resistance and physical properties of refractory brick using oil palm bunch

Rapatpon Thakonprajak¹, Wachira nukaew¹, Anupoom tatiwan¹
and Aukrit natkaeo^{2,*}

Refractory brick is a type of high-temperature brick that is used in high-temperature industrial applications. The aim of this study was to research and develop the formula of refractory brick by using oil palm bunch to enhance efficiency and reduce the prices. The formula is from mixing Ball Clay, Kaolin clay, Talcum, sand, and oil palm bunch mixed in various ratios by focusing on the ratios of sand and oil palm bunch. These sample results were tested in fire resistance at 1000 °C, water absorption and compressive strength. After heating all refractory bricks in 4 formulas, each formula has 4 samples for heating refractory brick test in a gas-firing kiln. It was found that refractory bricks formula 1 and 4 can withstand heat temperature at 1000°C. The percentage of water absorption after 24 hour immersion of formula 1 is 25.1% and formula 4 is 67.9%. Also, formula 1 can resist the most compressive strength of the screw test. The results showed that the ratio of the ingredients oil palm bunches and sand is a similar ratio property was less resistant. However, the addition of a significantly specific ratio of oil palm bunches or sand to the formula can improve its fire resistance and strength.

Keywords : Fire resistance, Oil palm bunch, Refractory brick

¹Piboonbumpen Demonstration School, Burapha University

²Science Classrooms in University-Affiliated School Project, Science Burapha University

*Corresponding author email: aukrit.na@uu.ac.th

Preparation of cellulose separator for lithium-ion battery from red water lily and water hyacinth fibers

Sasiwimon Kaewthongsorn¹, Sutthisa Konruang¹ and PornpanaBuaphet^{1*}

The purpose of this research is to produce the separator materials in lithium ion (Li-ion) batteries by preparing a paper method. The result of physical properties found that the thickness of red lotus was 15 μm and the water hyacinth was 28 μm , the porosity was 28.89% and 33.89% respectively. For the mechanical test, the tensile strength of the water hyacinth separator material was 47.153 MPa. The thermal properties test, it was found that cellulose separators exhibit more stable and better shrinkage behavior than commercial separators. Despite, the chemical properties test, it was found that the separator from red lotus had an electrolyte absorption of 87.50% and a height of 0.5 cm, while the separator from water hyacinth had an electrolyte absorption of 147.77% and a height. 8.0 cm. Compared with commercial interlayer materials, the values from multiple property tests were similar. Then the separator material from red lotus and the separator material from water hyacinth is another option to be a good separator material.

Keywords: Lithium-ion battery, Red Water lily, Separator, Water hyacinth

¹ Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93210, Thailand

*Corresponding author email: pornpana@tsu.ac.th

Study of physical properties and gamma-ray shielding properties of natural rubber /calcium carbonate composite

Sutthisa Konruang^{1,*} , Tanyawan Rodpayung¹ , Thawatchai Tepnual¹ , Pornpana Buaphet¹
and Narit Klompong²

This work prepared the gamma-ray shielding materials based on rubber compound (RC) mixed with CaCO₃ at different CaCO₃ contents (0, 50, 100, 150, and 300 phr). The physical properties and gamma-ray shielding properties of RC/CaCO₃ composites were tested. The results suggested that density increased with increasing CaCO₃ contents. However, hardness, tensile strength, elongation at break, and tear strength decreased when CaCO₃ contents increased. In addition, the results suggested that the increases in the CaCO₃ contents improved the gamma-ray shielding properties of the RC/CaCO₃ composites, such as linear attenuation coefficient, and half-value layer. The highest gamma-ray attenuation was 33.40% in 300 phr CaCO₃ contents. However, mass attenuation coefficient decreased when CaCO₃ contents increased.

Keywords: Calcium carbonate, Gamma-ray, Shielding materials

1 Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93210, Thailand

2 Department of General Education, Faculty of Science and Fisheries Technology, Rajamangala University of Technology
Srivijaya, Trang, 92150, Thailand

* Corresponding author email: email: Sutthisa@tsu.ac.th

Study of biodegradable poly(lactic acid)/thermoplastic starch/bio-silica composites

Piyanan Boonphayak¹ , Thanakon Hleekasem¹ , Theeraphat Dachsombat¹
and Sirikarn Khansumled ^{1*}

This research evaluated the mechanical, morphological, and biodegradation properties of biodegradable polymer composites prepared from polymer blends of poly(lactic acid) and thermoplastic starch (PLA/TPS) reinforced with bio-silica extracted from sugarcane leaves ash. To investigate the effect of TPS content on the properties of PLA/TPS blends, the amount of TPS was varied at 0, 10, 20, 30, 40, and 50 phr. The effect of varying concentrations of bio-silica (0, 1, 3, and 5 percent by weight). The biodegradable composites were compounded using a twin-screw extruder and compressed using a compression molding machine to create test specimens. The results showed that the increase in the TPS decreased the mechanical properties of the polymer blends due to the brittleness of the TPS. The morphology of biodegradable composites as revealed by scanning electron microscopy (SEM) revealed that PLA and TPS have poor interfacial adhesion. The addition of bio-silica enhanced the properties of elongation at break. Significantly, the current research has demonstrated that PLA/TPS/bio-silica can be considered for food packaging applications.

Keywords: Biodegradable, Bio-silica, Poly(lactic acid), Thermoplastic starch,

¹ Department of Industrial Engineering, Faculty of Engineering, Naresuan University, Phitsanulok, 65000, Thailand

*Corresponding author email: sirikarnk@nu.ac.th

Influence of aluminium contents on the structure and hardness of chromium aluminium nitride thin films

Nirun Witit-anun¹ and Adisorn Buranawong^{1,*}

This research aims to study the influence of aluminum content in film on the structure and hardness of chromium aluminum nitride thin films, which are deposited on silicon by reactive DC unbalanced magnetron sputtering method from the Cr-Al alloy target (50:50 at%). The structure, chemical composition, morphology, and hardness were characterized by XRD, EDS, FE-SEM, and nano-indentation techniques, respectively. The results showed that the as-deposited films were formed as a (Cr, Al)N solid solution with fcc structure in the (111), (200), and (220) planes. The as-deposited film has lattice parameters in the range of 4.088-4.138 Å, the as-deposited film has nano-structure whereas the average crystallite size was in the range of 3.1 - 16.8 nm. The chemical composition from the EDS technique shows that the as-deposited film has chromium (Cr), aluminium (Al), and nitrogen (N) as the main component in different ratios. The FE-SEM micrograph presented that the Al contents affected the surface morphology and cross-sectional of the as-deposited film. The hardness of films measured by the nano-indentation technique increased from 12.47 GPa to 67.29 GPa with an increase of Al contents.

Keywords: Aluminium content, CrAlN, Reactive magnetron sputtering, Thin films

¹Department of Physics, Faculty of Sciences, Burapha University, Chonburi

Thailand Center of Excellence in Physics (ThEP), Ministry of Higher Education, Science, Research and Innovation (MHESI)

*Corresponding author, email: adisornb@buu.ac.th

Efficient Detection of SO₂ gas using rGO/SnO₂ nanocomposites-based sensors

Viruntachar Kruefu^{1,*}, Kata Jaruwongrungee², Narong Chanlek³ and Anurat Wisitsoraat⁴

In this research, nanocomposite structure gas sensors were fabricated to development of a smart sulfur dioxide sensor for the fumigation of fresh longan. The pure SnO₂ and rGO/SnO₂ nanocomposites were easily synthesized using reflux and hydrothermal method and studied for gas sensing applications towards SO₂ at high concentration levels (3000 – 15000 ppm). The systematic characterizations performed by XRD, SEM, TEM, SSA_{BET}, XPS and Raman were confirmed by the presence of SnO₂ deposited on few-layer rGO while the presence of high specific surface area of rGO/SnO₂ was observed. From systematic gas sensing measurements, the sensing films of rGO and rGO/SnO₂ nanocomposite were performed under the operating temperature of ambient to 350 °C. The results illustrate that the Ru-rGO/SnO₂ sensing film exhibits a great sensing performance toward high concentrations of SO₂ gas (3000 – 15000 ppm) at 250 °C, with high response, good selectivity, and outstanding stability.

Keywords: Fresh longan, Fumigation, Nanocomposites, rGO/SnO₂, SO₂ Gas sensor

¹ Applied Physics Program and Nanoscience and Nanotechnology Program, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand.

² National Electronics and Computer Technology Center, National Science and Technology Development Agency, Klong Luang, Pathumthani 12120, Thailand.

³ Synchrotron Light Research Institute, Nakhon Ratchasima 30000, Thailand.

⁴ National Science and Dual-Use Technology Center, National Science and Technology Development Agency, Klong Luang, Pathumthani 12120, Thailand.

* Corresponding author email: v_viruntachar@hotmail.com

The off-cardinal alignment of Chiang Mai's city plan in relation to the Orion's belt

Chayapon Iemsonthi¹, Seksit Lorwilai¹, Panuwit Sankaokam¹

Orapin Riyaprao² and Cherdsak Saelee^{3,*}

Chiang Mai, the largest city in northern Thailand, was once the capital city of the ancient Lanna kingdom, founded by King Mangrai on 19 April 1296. The historic city plan, which may have been influenced by Vaastu Shastra (an ancient Hindu knowledge of architecture), features a square shape with a side length measured at approximately 1.6 kilometers, bordered by four walls facing the cardinal directions. However, a careful examination reveals that the east-west orientation of the city plan is tilted southeastward with an azimuth of 92.5° , prompting further investigation as to which method was used in the city's orientation. Historically, two ways to lay out the directions were via the gnomon, such as the shortest shadow and the Indian circle methods, and via fixed stars. In this work, we carried out year-long measurements of the shortest shadow and the Indian circle methods and discovered that neither resulted in an error greater than 0.7° , allowing us to consider the orientation method as being associated with specific fixed stars. A theodolite and a GPS were used to identify the orientation axis along the northern city wall, which was then calibrated using the positional astronomy program Stellarium. Using precession corrected Stellarium, the ancient sky can be recreated to uncover the aligned star at the same azimuth as one of the three rising stars in the Orion's Belt. The construction period between 1292 and 1296, which is close to when King Mangrai founded the city, is also obtained by the simulation.

Keywords: Chiang Mai City Planning, Gnomon, Lanna Kingdom, Orion's Belt

¹Science Classroom Affiliated School Project, Chiang Mai University Demonstration School, Thailand

²National Astronomical Research Institute of Thailand (Public Organization), Thailand

³Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Thailand

*Corresponding author, email: cherdsak.s@cmu.ac.th

Optically stimulated luminescence dating revealed the late quaternary coastal sediments in Songkhla coast, Thailand

Araf Laerosa^{1,2}, Siriporn Pradit^{1,2}, Montri Luengchavanon² and Prakrit Noppradit^{1,2*}

Coastal sediments along the Songkhla coast still lack chronological data to describe their evolution. In this study, coastal sediments that were classified early were taken with the real-time kinematic survey by the Global Navigation Satellite System. A field survey confirmed the two ridges parallel to the Songkhla lagoon coast in Hatyai district. Samples were taken from the old ridges and plains behind the ridges and dated by optically-stimulated luminescence (OSL) with the single aliquot regenerative dose protocol. The dating results were 10.0, 30.5, 39.2 ka (thousand years), and a saturated equivalent dose sample. The numerical ages in this study confirmed the humid period around 40–30 ka before the drought period in the late glacial maximum (LGM). However, in this area, there was a hiatus during LGM. The younger sediment here was 10 ka when the sea level transgressed in the early Holocene. Since then, the lagoon coast only appears as tidal flat sediment. This study can be used as a preliminary study of the Songkhla lagoon formation.

Keywords: Geological evolution, OSL dating, Paleoenvironment, Single aliquot regeneration, Songkhla lagoon

¹ Coastal Oceanography and Climate Change Research Center, Prince of Songkla University, Hatyai, 90110, Thailand

² Faculty of Environmental Management, Prince of Songkla University, Hatyai, 90110, Thailand

* Corresponding author email: prakrit.n@psu.ac.th

The effects of initial numbers of dice on decay constant

Pongsak Khokhuntod^{1,*}, Ratchanoo Katman² and Attapon Amthong¹

The analogy of dice rolling and nuclear decay is often used in Physics lab teaching because cheap equipment can be obtained more easily and safely than real radioactive elements. From the experiment, we often encounter the decay constant problem, which is discrepant from the theoretical value. Therefore, in this research, the trend of decreasing numbers of dice after dice roll was studied by the real dice roll method and computer simulation. This study assumes that the initial numbers of dice affect the decay constant. In the experiment, a 6-faced dice was used, and the initial number of dice was from 10 to 150 (by increasing the number of 10 dice in the following experiment). The obtained results from both methods were used to analyze linear equations to get R^2 and the standard deviation of R^2 (S.D. of R^2). These parameters will be used to consider the optimal initial number of dice. Finally, the decay constant was calculated and compared to the theoretical decay constant proposed by Murray & Hart (2012) and Santostasi et al. (2017). From the results of this study, the researcher has proposed that the optimal initial number of dice is 80 or more (because of the high values of R^2 and low values of S.D. of R^2). The average decay constant of the real dice roll and the computer simulation were 0.1867 and 0.1839, respectively. Comparing the decay constants from this study and from Murray & Hart (2012) and Santostasi et al. (2017), which was 0.1823, the discrepancy was 2.414% and 0.878% respectively. The proposed initial number of dice is very useful in Physics lab teaching, which is appropriate and efficient because students can draw a straight-line trendline and they can get the slope to calculate the decay constant by using the least time but still get the decay constant close to the theoretical value.

Keywords: Decay constant, Dice-shaking, Radioactive decay

¹Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

²Program of Physics, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok, 65000

*corresponding author e-mail: pongsakk@nu.ac.th

Applying optical technique to determine value of young's modulus

Paradorn Pakdeevanich^{1,*}, Sittisak Jaiyindee¹ and Kanok Hournkumnuard¹

The method of diffraction of light and the method of reflection of light on flat mirror were applied for determination the value of Young's modulus. For the diffraction of light method, two shaving blades were utilized. The first blade was fixed and the second blade was contacted with the testing wire. Initially, the edges of blades were concealed exactly. When the wire was pulled down, the separation between blades equaled to the elongation of wire. By focusing laser beam to the aperture between blades, the diffraction pattern was observed. The elongation of wire was analysed from the width of central fringe of diffraction pattern. The linear relationship between the elongation of wire and the loading mass was obtained. The value of Young's modulus was analysed from the slope of graph. On testing with copper and steel wires, the Young's modulus values were 68 GPa and 85 GPa, respectively. For the technique of reflection of light by flat mirror, the mirror was installed on based. While the bottom rim of mirror was free rotation, the top rim of mirror was pulled down. Therefore, the plane of the mirror was tilted. The tilted angle depended on the loading mass. When laser beam incident on mirror, the shift of displacement of reflecting beam was related to the elongation of wire. The value of Young's modulus for copper and steel wires were 64 GPa and 91 GPa, respectively. Comparing the obtained values with the standard measurement, the percentage error was found to be 36-57%.

Keywords: Diffraction of light, Optical technique, Young's modulus

¹ Department of Physics, Faculty of Science, Silpakorn University, Nakorn Prathom, 73120

*Corresponding author email: pakdeevanich_p@su.ac.th

Theoretical study of electrical properties of twisted bilayer graphene

Phicharn Phommajak¹ and Kridsanaphong Limtragool ^{1,*}

Twisted bilayer graphene (TBG) has recently been studied and found that at some twisted angles (TA) — the magic angles, it becomes superconducting at low temperatures. In this work, we study the band structure of TBG using the Bristitzer and MacDonald model. This model exhibits flat bands near Fermi energy at the magic angle of 1.05° . We calculate the electronic heat capacity and electrical conductivity as a function of temperature (T) and TA ranging from 0.80° to 5.00° . We find that, as TA is tuned toward the 1.05° magic angle, the electronic heat capacity develops a pronounced peak at low T and the electrical conductivity gradually becomes smaller. These properties of TBG can be attributed to the appearance of the flat bands and, thus, the vanishing of group velocity at the magic angle.

Keywords: Electrical conductivity, Electronic heat capacity, Graphene, Magic angle,

¹ Department of Physics, Faculty of Science, Maharakham University, Maharakham, 44150

*Corresponding author email: kridsanaphong.l@msu.ac.th

Moiré fringes analysis of parallel gratings by eliminating the effect of high frequency components

Anucha Kaewpoonsuk^{1,*}

In this work, a method for analyzing parallel grating moiré fringes is presented. The proposed analytical technique relies on the Fourier series of two rectangular signals interacting with algebraic operators that are equivalent to two logical operators, the "AND" operator, and the "OR" operator. In the final analysis, equations are considered in cases where the effects of high-frequency components are excluded. The analysis results reveal interesting patterns nestled beneath the messy images of moiré fringes. Comparison between the analyzed equations and the mean intensity determination (eliminating the high-frequency component) of the Moiré fringes images formed by the overlapping parallel gratings shows that they are consistent.

Keywords: Average intensity, Fourier analysis, Grating, Moiré fringes

¹Department of Physics, Faculty of Science, Naresuan University, Phitsanulok 65000 Thailand

*Corresponding author, email: anuchak@nu.ac.th

Anisotropic flow in Au + Au collision at 1 A GeV by using quantum molecular dynamics model

Kanticha Kankaew¹ , Sataporn Tippayaruck¹ , Jiraphat Phusamlee¹ , Natha Onintr¹ Nuttawut Kantham¹ , Natthaphat Thongyoo¹ , Pornrad Srisawad¹ and Phacharatouch Chaimongkon^{1,2,*}

The Anisotropic flow in Au + Au collision at 1 A GeV using a quantum molecular dynamics model was concentrated. The direct flow of proton (v_1) as a function of rapidity (y_0) at intermediate energy around 1 A GeV and impact parameter from 0.25 to 0.45 fm with the nuclear equation of state (Soft and Hard equation of state) were computed and compared with FOPI experiment. The results showed that the direct flow of proton as a function of the rapidity with a soft equation of state was consistent with the FOPI data. The behavior of the nuclear equation of state at high temperature and high density could be explained by the theoretical calculation result of the proton flow from Au + Au collision at intermediate energy.

Keywords: Anisotropic flow, Direct flow, Equation of State, Heavy-ion collision, QMD model

¹Department of Physics, School of Science, University of Phayao, Phayao, 56000, Thailand

²Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000, Thailand

Collective expansion of K^+ mesons in heavy-ion collisions on the effect of in-medium Kaon potential and the nuclear equation of state

Wannapa Khamjeen², Panadda Sittiketkorn¹, Lalana Nunthagornpituk², Sutaphat Phansuwan², Nutkamol Suwannasri², Oraorn Kaewchot², Kristiya Tomuang³, Natthaphat Thongyoo⁴, Yaphakhakorn Chaimongkon², Pornrad Srisawad⁴
and Phacharatouch Chaimongkon^{2,4,*}

The focus of this work is to examine the production cross sections of K^+ as a function of the transverse kinetic energy ($m_T - m$) on a nuclear equation of state for K^+ production in heavy-ion collisions, using a quantum molecular dynamics model (QMD). Specifically, the production of K^+ from $^{58}\text{Ni}+^{58}\text{Ni}$ collisions at an energy of 1.93 A GeV and a rapidity range (y_{cm}) of -0.69 to 0.06 is considered. The resulting cross-sections of K^+ production as a function of transverse kinetic energy are calculated and compared with KaoS experiments. Theoretical calculations are conducted with and without the Brown-Rho (K^+N) potential, as well as a soft and hard equation of state (EoS). Results show that the theoretical calculations with the soft EoS are similar to those with the hard EoS. Furthermore, the theoretical calculations with the soft and hard EoS, while taking into account the Brown-Rho (K^+N) potential, are consistent with the KaoS experiment. This indicates that the production cross-sections of K^+ as a function of transverse kinetic energy are a highly sensitive probe for examining the equation of state at high temperature and high density.

Keywords: Cross-sections, Kaon, QMD, Soft and hard EoS, Transverse kinetic energy

¹Department of Physics and General Science, Faculty of Science and Technology, Nakhon Sawan Rajabhat University, Nakhon Sawan, 60000, Thailand

²Department of Physics, School of Science, University of Phayao, Phayao, 56000, Thailand

³General Education, Siam Technology College, Bangkok, 10600, Thailand

⁴Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000, Thailand

* Corresponding author email: phacharatouch.ch@up.ac.th

Mobile photovoltaic power system

Punyapat Inklab^{1,*}, Pichapak Tongsut¹ and Morakot Sankul¹

As the world population increases, the demand for human energy will expand regularly. Therefore, in the future, renewable energy is important and should continuously increase. For this reason, our team did this project to create a mobile photovoltaic power system. In operation, the creation of the project consists of selecting and preparing equipment, testing the main equipment; solar panel and batteries, and data collection, which will be divided into 2 sets; as the 1st for the battery charging period from the solar cell panel and the 2nd set is the light intensity data of spotlight every 10 minutes and spotlight usage time per battery charge, assembling the built photovoltaic power system and display of information by the Internet of Things. In summary, it can be concluded that the optimum light intensity is in the range of 20 – 41 lux, which is used for 18.5 hours. The usability of the mobile photovoltaic power system can be controlled on-off by using an automatic timer switch and can display the electric potential difference at various locations in the system by Blynk website or application.

Keywords: Alternating current, Direct current, Internet of thing, Mobile, Photovoltaic

¹Naresuan University Demonstration School, Naimuang Muang, Phitsanulok 65000.

*Corresponding author, email: punyapati65@nu.ac.th

Trash separator

Kanjarat Piamsuwongthong¹ and Priyakorn Rachaprommin^{2*}

The purpose of our trash separator project is to separate non-metal and metal trash. As a result, we are able to recycle metal waste and regenerate them into new ones. In addition, we also decrease several pollutions that were created from disposing of metal trash together with non-metal trash. Pollutions are either air pollution or water pollution which both have an impact on our health. Our limitation is the metal and non-metal garbage which we collected are only produced by the students from and in Naresuan University Secondary Demonstration School. The trash separator includes ESP8266 as a microcontroller, Ultrasonic sensor as a sensor for letting ESP8266 detect there is trash. And also has a capacitive proximity sensor together with an inductive proximity sensor for separate metal and non-metal trash. According to the result, our trash separator is able to distinguish metal trash out of non-metal trash. The bin has 75% efficiency which has two conditions that decrease the percentage. First is the distance between the trash and the sensors which must be below five centimeters. The second is the size of the trash, which must have a diameter below six centimeters.

Keywords: Metal trash, Non-metal trash, Separating trash

¹ Naresuan University Secondary Demonstration School, Naresuan University, Phitsanulok, 65000

² Naresuan University Secondary Demonstration School, Naresuan University, Phitsanulok, 65000

* Corresponding author email: priyakornr64@nu.ac.th

The biofilm-based triboelectric generator from durian peel

Patharacha Kongchana¹ and Panupong Jaiban^{1, 2 *}

This research involved durian peel waste synthesized into carboxymethyl cellulose (CMC) to form a biofilm. The structure and composition on the surface of the biofilm were studied using scanning electron microscopy (SEM) in combination with energy dispersive X-ray spectroscopy (EDS). The structure of cellulose crystals was studied by X-ray diffraction (XRD) analysis. Fourier transform infrared spectroscopy (FTIR) was used to confirm the methyl group, carboxyl group, hydrocarbon group, hydroxyl group, ether and ester group in cellulose, carboxymethyl cellulose and biofilms. The biofilm was used as the negative electrode and the aluminum tape as the positive electrode in a triboelectric generator (TEG) capable of generating a maximum output voltage of 7.07 V and a maximum measured current of 29.34 nA. This can light up 15 commercial light-emitting diodes and study how the increase in mechanical stress affects the output voltage and output current. This indicates the efficiency of biofilm from durian peel waste in energy harvesting.

Keywords: Carboxymethyl cellulose, Cellulose, Durian peel, Triboelectric generator

¹Faculty of Science, Energy and Environment, King Mongkut's University of Technology North Bangkok, Rayong Campus, Rayong, 21120, Thailand

²Research Center for Quantum Technology, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

*Corresponding author, email: panupong.j@kmutnb.ac.th

Triboelectric generator from the natural rubber

Prangwilai Phuttami¹ and Panupong Jaiban^{1,2,*}

PVA solutions have been synthesized by spin coating method using polyvinyl alcohol and deionized water were used as the starting precursor and solvent. The PVA thin film and natural rubber film were then used to form a triboelectric generator (TEG) device to a different size and attached a conductive copper tape as an external electrode. In the production of triboelectric generators in single-electrode mode (SE) by contacted and separating, based on the combination of electrostatic induction. The surface morphologies of the as-prepared thin films were examined with scanning electron microscopy (SEM). The crystallinity of the fabricated thin films was determined by using X-ray diffraction (XRD) measurement. The functional groups of thin films were confirmed by fourier transform Infrared (FTIR). The optical transmittance of the thin films were investigated by using UV-VIS spectrophotometer (UV-2600). The TEG generated a output voltage of 18.31, 9.44 and 9.59 V and current of 0.05, 0.03 and 0.03 μA , respectively This represents a new technology for energy harvesting.

Keywords: Natural rubber, Polyvinyl alcohol, Spin coating, Triboelectric generator

¹Faculty of Science, Energy and Environment, King Mongkut's University of Technology North Bangkok, Rayong Campus, Rayong, 21120, Thailand

²Research Center for Quantum Technology, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

*Corresponding author, email: panupong.j@kmutnb.ac.th

Electric energy harvesting from mechanical force by cassava bioplastic films

Nattapon Kongtaworn¹ and Panupong Jaiban^{1,2*}

In this research, the synthesis of starch from cassava was studied. to produce a bioplastic film using substrate Solvents and additives, including tapioca starch deionized water and glycerin, respectively. using different ratios of substrates, namely 10, 15 and 20 g. Then polydimethylsiloxane (PDMS) was used to form the film. The PDMS film was then paired with the bioplastic film. To create a triboelectric generator (TEG) device with a single electrode mode (SE mode). The device was used to attach copper tape as the negative electrode. by contact and separation between the two materials. Based on the principle of triboelectrification and electrostatic induction. The experimental results of different substrates at 10, 15 and 20 g, peak voltage densities of 3, 4 and 8 V, respectively, and peak current densities of 0.1, 0.2 and 0.3 μA , respectively. The surface characteristics of the film were then analyzed using scanning electron microscopy (SEM). The crystallinity of the film was analyzed by X-ray diffraction (XRD). Molecular properties of bioplastic films were analyzed using Fourier transform infrared spectroscopy (FTIR). To study the absorption properties of bioplastic film. using the machine UV-Visible Spectrophotometer (UV-2600) This research demonstrates the good properties of biofilms from cassava starch as suitable films for efficient energy harvesting TEG devices.

Keywords : Electrostatic, Triboelectric , Triboelectrification

¹Faculty of Science, Energy and Environment, King Mongkut's University of Technology North Bangkok, Rayong Campus, Rayong, 21120, Thailand

²Research Center for Quantum Technology, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

*Corresponding author, email: panupong.j@kmutnb.ac.th

Process optimization of reclaimed rubber preparation from tire waste

Passara Suwanasing^{1,*}, Kanoktip Boonkerd² and Sirilux Poompradub³

It was well known that the rubber chains must be crosslinked in order to increase the strength in the rubber product. However, the crosslinking between rubber chains results in the inability to reprocess the rubber. This makes it impossible to reuse the used rubber products or rubber waste from the production process. Currently, a process for reusing rubber has been developed by breaking the crosslinks in the rubber structure. This process is called devulcanization and the obtained product is called reclaimed rubber. Tires are rubber products that have been massively used. This results in a large amount of tire waste. This research aims to study the optimum conditions for preparing reclaimed rubber from tire waste by a twin-screw extruder by varying the screw rotation speed at 150, 200 and 250 rpm and the mixing zone temperature at 200, 225 and 250 °C. The proportion of rubber in the tire waste used in this study was 53.5%. When testing Mooney viscosity, it was found that the increase in screw rotational speed and mixing zone temperature resulted in the decrease in Mooney viscosity of the reclaimed rubber. The reclaimed rubber prepared by a twin screw extruder at the screw rotation speed of 250 rpm and the mixing zone temperature of 200 °C had the highest tensile strength and elongation at break. It contributed to its highest percentage of vulcanization. It made this reclaimed rubber in having the highest thermoplastic behavior. Therefore, when reprocessing it, it gave the highest mechanical properties. Reclaimed rubber can be reused to replace the virgin rubber with proper loading. Since it was found that the mechanical properties of vulcanized rubber decreased with the increasing amount of reclaimed rubber used to replace virgin rubber.

Keywords: Mixing zone temperature, Reclaimed rubber, Screw rotation speed, Tire waste, Twin screw extruder

¹ Major of Science for industry, Faculty of Science, Chulalongkorn University, Bangkok, 10330

² Department of Material Science, Faculty of Science, Chulalongkorn University, Bangkok, 10330

³ Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, 10330

*Corresponding author, 6472030823@student.chula.ac.th

Heart rate and blood oxygen saturation monitor based on IoT.

Kanjarat Piamsuwongthong^{1*} and Priyakorn Rachaprommin²

One of the most accurate ways to indicate a patient's vital is to monitor a patient's blood oxygen saturation and heart rate. And in order to measure the data, it has to be due by using pulse oximeter. Currently, there are many versions of the monitor already but it seems to us that it can be more friendly to a user. So, this project is aimed to introduce the new version of the monitor which is able to measure both blood oxygen saturation (SpO₂) and heart rate (HR) by using light reflection technique. Our invention can transfer the data in real time via IoT and display them on mobile phone application and website. Moreover, our measurement is designed to be small, wearable and extreme flexibility because of the use of ESP32 as a main microcontroller and battery as a main energy resource. Our performance testing is due by comparing the data from our invention to a standard oximeter. The data are collected from 5 participants. And the result turns out that our innovation can read the oxygen saturation and heart rate data to be accurate for 97.17 % and 98.69 % respectively. And the reading has been delayed due to transmission and display data on application around 10 sec per 1 time. Thus, our project is expected to facilitate continuous monitoring of SpO₂ and HR for patients with clinical indications.

Keywords: Blood oxygen saturation (SpO₂), Heart Rate (HR), Internet of thing (IoT), Pulse oximeter

¹ Naresuan University Secondary Demonstration School, Naresuan University, Phitsanulok, 65000

² Naresuan University Secondary Demonstration School, Naresuan University, Phitsanulok, 65000

* Corresponding author email: kanjaratp64@nu.ac.th

Development of pH and humidity measurement and control systems in hydroponic plants greenhouses with IoT technology by Blynk application on a smartphone

Pitichod Jitkaew¹ , Waranthon Wanichnam¹ , Pitak Pooljareansin^{1,*}

This study is focused on the development of IoT-based systems for measuring and controlling pH and humidity in hydroponic plant greenhouses using the Blynk application on a smartphone. The research also evaluates the effectiveness of the pH and humidity control system and measures the accuracy of greenhouse humidity, solution temperature, greenhouse temperature, and light intensity measurements over ten trials. Moreover, the study calculates the percentage error of each measurement. The results indicate that the light intensity can be measured with an error percentage of 0.34% when compared to a lux meter, solution pH can be measured with 2.77% error percentage when compared to a pH meter, greenhouse humidity can be measured with 1.33% error percentage when compared to a hygrometer, greenhouse temperature can be measured with 2.81% error percentage when compared to a thermometer, and solution temperature can be measured with 2.60% error percentage when compared to a thermometer. Lastly, the water opening and closing control and pH control systems demonstrated a 1.25 second delay time.

Keywords : Blynk, Hydroponics, Internet of things, IoT

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

*Corresponding author, email: pitak.iearth@gmail.com

Development of a sensor system for measuring sound frequency in beehives to analyze the behavior of bees after being impacted by external noise disturbance

Chayapat Wiangnaksansuk^{1,*}, Tipwan Suppasat² and Niyom Hongsith³

This research aims to develop a sensor system for measuring the frequency of sound in beehives, in order to analyze the behavior of bees when they are exposed to external sound waves. The main components of the sensor system are an Arduino UNO R3 board and a small microphone. The microphone's sound signal is converted to a frequency signal using the Fast Fourier Transform (FFT) process. Normal frequency data in the beehive is collected under normal conditions and compared with frequency data after exposure to external sound waves. By comparing the frequency spectrum values measured after the noise disturbance with those measured under normal conditions, it was found that the amplitude was higher than the normal sound wave in the frequency range of 300 - 400 Hz. The change in frequency that occurred was due to the sudden response of bees when exposed to the disturbance, causing increased movement within the beehive. Additionally, some abnormal frequency values ranging from 100 - 1000 Hz were observed in certain periods that frequency value differ from normal value range of 100 - 600 Hz, which may be due to other types of external disturbances that the sensor was able to detect. The behavior of the bees after being exposed to external disturbances can be observed by changing of frequency value, which can be analyze the issue and applied to the conservation of bee species in the future.

Keywords: Amplitude, Beehive, Frequency, Sensor

¹Demonstration School, University of Phayao

²Department of Biology, School of Science, University of Phayao

³Department of Physics, School of Science, University of Phayao

*Corresponding author email: 64341577@up.ac.th

Development of an application to measure arterial oxygen saturation and monitor falls in the elderly using ML and IoT

Nattapong Apirattanon¹, Sudarat Tokampang¹, Noppadon Sisuk² and Kreangsak Promphak^{1,*}

Pollution matters (PM2.5) can have a major impact on the lives of older people, especially those with respiratory and lung. Therefore, a blood oxygen measurement is one of the vital signs that shows how well one is breathing. which, if there is a respiratory condition, will increase the elderly's risk of falling. This research aims to develop a fall detection application that measures the blood oxygen level of the elderly and displays it on a smartphone. The system uses an Arduino Nano 33 BLE microcontroller with a tiny machine learning (TinyML) model built for fall detection in the elderly and collects data into a Firebase database over the Internet of Things (IoT). The measurement of the vital signs will use the MAX30100 sensor as a blood oxygen saturation sensor. Heart rate and pulse oxygen are displayed on the smartphone screen. The fall test results in forward, backward, left, and right directions were 100%, 100%, 95%, and 95% respectively. The real-time heart rate and pulse oxygen can be displayed on the smartphone, which can check the history of heart rate and pulse oxygen values in Google Sheets.

Keywords: Arterial Oxygen Saturation, Fall Detection, Google Sheets, Internet of Things, Machine Learning

¹Department of Physics, Faculty of Science, Naresuan University Phitsanulok, Thailand, 65000

²Program in Computer Engineering, Faculty of Industrial Technology Phibunsongkhram Rajabhat University, Phitsanulok, Thailand,65000

*Corresponding author, email: e-mail: kriangsakp@nu.ac.th

Measurement and control system for water and nutrient supply

Sudarat Tokampang¹ , Nattapong Apirattanon¹ , Noppadon Sisuk² and Kreangsak Promphak^{1,*}

This research aims to develop a control system and monitor irrigation and fertilizer for drip-irrigated melon production using the Internet of Things (IoT). In this research, sensors will be installed in the melon greenhouse, including temperature and humidity sensors inside and outside the greenhouse, a water temperature sensor in the tank, a water level sensor, and two water pumps. The first serves as a stirring pump for mixing water-soluble fertilizers, and the second serves as a pump for watering the melons. Test results are displayed in the web application. Displays temperature and humidity readings from attached sensors. To calibrate temperature data in the system, such as temperature and humidity inside the greenhouse, temperature, and humidity outside the greenhouse, water temperature, and water level values. When compared with standard tools, the multiple determination coefficients were found to be 0.9427, 0.9338, 0.9481, and 0.997, respectively and when testing the proposed system on a melon-growing plot, it was found that the parameter accuracies were 94.17%, 98.65%, 99.35%, and 96.34%, respectively. Control fertilization, control water agitation, and control water distribution to ensure fertilizer works well at the specified time.

Keywords: Growing plants in greenhouses, Internet of things, Melon

¹Department of Physics, Faculty of Science, Naresuan University Phitsanulok, Thailand, 65000

²Program in Computer Engineering, Faculty of Industrial Technology Phibunsongkhram Rajabhat University, Phitsanulok, Thailand,65000

*Corresponding author, email: e-mail: kriangsakp@nu.ac.th

Recognition of squat strength exercises based on machine learning system

Noppadon Sisuk¹, Pattanasak Sahavisit², Surat Buran²,
Piyaphon Prakhongchai² and Kreangsak Promphak^{2,*}

This article presents a wearable embedded device that can count squat strength exercises as a smartphone application. Embedded systems are built through a neural network-based machine learning process using Edge Impulse, where acceleration data from the accelerometer sensor that change according to exercise posture will be taught to recognize specific features to create a machine learning model. The machine learning model is then embedded on an Arduino Nano 33 BLE Sense board to create a fitness wearable and display the counting results on the smartphone. The proposed system was tested with five volunteers in 2 postures: Squat and Jump. The results showed that the presented system had a posture prediction accuracy for Squat and Jump was 97% and 96 %, respectively.

Keywords: Machine learning, Neural network, Squat strength exercises

¹Program in Computer Engineering, Faculty of Industrial Technology Phibunsongkhram Rajabhat University, Phitsanulok, Thailand,65000

²Department of Physics, Faculty of Science, Naresuan University Phitsanulok, Thailand, 65000

*Corresponding author, email: e-mail: kriangsakp@nu.ac.th

Wearable ECG and heart rate recorder for smart healthcare systems

Noppadon Sisuk¹, Tada Onkhong², Anucha Kaewpoonsuk²,
Pramote Wardkien³ and Pott Pongpaopattanakul^{4*}

Embedded systems that are remotely connected via wireless communication are popular to create low-cost, portable medical devices for monitoring heart rate. and an electrocardiogram (ECG), which plays an important role in diagnosing heart disease. This paper presents an ECG monitoring and processing system, which can monitor in real time and display and record the results of ECG signal and heart rate on computer. The system consists of three main units: the ECG sensing segment using the AD8232 module, which detects the ECG using surface-mounted electrodes. The measured signal chest is transmitted via a NRF24L01 wireless communication system connected to the ESP32, both receiver and transmitter, to be displayed and processed on an application installed on the computer. The values obtained will show the ECG signal and heart rate. The application used by the patient is easy to understand and can be sent to the physician from a distance of up to 1 kilometer in the open air and 200 meters in the shade. The result of the heart rate that can be measured via ECG gives an accuracy of 99.77% compared to standard equipment. In addition, the ECG that can be recorded has all the components according to the standard ECG value.

Keywords: Electrocardiogram, Heart Rate, Smart Healthcare Systems

¹Program in Computer Engineering, Faculty of Industrial Technology Phibunsongkhram Rajabhat University, Phitsanulok, Thailand,65000

²Department of Physics, Faculty of Science, Naresuan University Phitsanulok, Thailand, 65000

³Department of Telecommunications Engineering, King Mongkut's Institute of Technology Ladkrabang Bangkok, Thailand, 10520

⁴Department of Cardio-thoracic Technology, Faculty of Allied health sciences, Naresuan University Phitsanulok, Thailand, 65000

*Corresponding author, email: pottp@nu.ac.th

Oral Presentation

กลุ่มที่ 7 สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์

An Automated guided vehicle robot for transport in confined place

Thanpisit Peekaw¹, Nophakon Kantakad¹ and Sarit Promthep^{2,*}

Nowadays, robots have been used in the most facilities and many industries. However, it is rarely seen in Thailand and some other in-developed country. So, we had studied this robot based on Automated guided vehicle or an AGV. This project was developed and produced with aim of helping people in confined place especially the officer who works in the office. We had found that IoT was the worth for the AGV. This AGV has two components. one of them is all the AGV body and main-controller system. The another is the Main command system. By put an order to in command website, system will send order to the main-controller in AGV, and it will move to the destination by Light-sensors movement system. From the actual test prototype that made by lego EV3, it was found that AGV can work properly well with Light-sensors system. The command system is almost done for continue test.

Keywords: AGV, Command System, Light-Sensors System

¹ Demonstration School University of Phayao, University of Phayao, Phayao, 56000

² Department of Computer Science, School of Information and Communication Technology, University of Phayao, Phayao, 56000

*Corresponding author, email: Sarit.pr@up.ac.th

Lifting posture monitoring application for preventing ergonomics risk factors

Waritsara Jongsomboonpoka^{1,*} and Jinjuta Tamruang-it¹

Manual lifting is a main factor in work-related musculoskeletal disorders (WMSDs). The objectives of this study were 1) to develop an application for warning inappropriate posture while lifting and 2) to test the usability of the application. The application was developed regarding the NIOSH lifting equation, including the recommended weight limit (RWL) and lifting index (LI) values. The RWL is the recommended maximum weight for lifting and is calculated by eight factors including Load constant, Horizontal location, Vertical location, Distance, Asymmetry angle, Duration of lifting, Frequency of lifting and, Coupling. The LI is the degree of risk of such lifting and is calculated by Load Weight/RWL. In addition, the application also provides information about ergonomics and recommends correct lifting posture. The application was tested for usability in twenty-one participants. The result found that the application can provide a warning about recommended maximum weight for lifting and risk levels of WMSDs. The usability scale was 68.45% Which means moderate satisfaction. It ought to be suggested that lifting workers should use this application to assess risk before lifting objects and consider lifting posture correctly. Organizations should utilize this application to evaluate workers' lifting tasks to prevent WMSDs.

Keywords: Ergonomics, Lifting index, Lifting posture monitoring application, Recommend weight limit

¹ Naresuan University Secondary Demonstration school, Faculty of Science, Naresuan University, Phitsanulok, 65000

*Corresponding author, email: waritsaraj64@nu.ac.th

Smart lock system by IoT

Natthaphong Thippaha^{1,*}, Phongsakon Wongdoihwan¹ and Wuttisak Karnjanapa¹

Nowadays, IoT (Internet of Things technology) is an evolving technology and is the basis for innovation, products, and services to facilitate the public. Due to the theft problem of stealing valuable property, humans are prevented from theft by using bolts to lock their homes and buildings or using padlocks to lock lockers or storage boxes. But the next problem is the loss of keys and many other problems. making it impossible to lock or unlock this can lead to theft problems. Therefore, the authors have invented a smart lock system with 2 NodeMCU ESP8266 boards as a device that connects various devices together. And ESP8266 acts as a connection Internet and is connected to the Blynk application to control the mobile phone operation. There is a keypad used to press the password to unlock and there is an LCD screen showing the status of the door. And in every action done on the door will be notified via Line using Line Notify. All control programs are written through the Arduino IDE program. Smart lock system can work efficiently. Both in the Keypad and Blynk sections, the status notification via the LCD screen, including notifications via Line Notify, can be accurately notified.

Keywords: Arduino IDE, Blynk application, IoT, Line Notify, NodeMCU ESP8266

¹ Naresuan University Secondary Demonstration School, Phitsanulok, 65000

*Corresponding author, email: natthaphongt65@nu.ac.th

Plastic Plastic bottle recycling machine

Wee Warasincahi¹ and Boonsong Henngam^{2,*}

Plastic is a polymer group, which has high molecular weight and is synthetically produced. It is used in many applications. Plastic in every form is take a long time to break down and it not found in nature, leading to environmental issues such as air pollution and microplastics in oceans. Recycle is one way that can reduce these issues. This project objective is to make a recycling machine that can reduce plastic waste in Piboonbumpen Demonstration School. Start by compile plastic bottle in our school. Then design and build a machine that can melt and cut plastic into plastic line. Finally test a machine and calculate the cost of recycling. The result is this machine can reduce plastic west in our school however this will cost more than disposal.

Keywords: Plastic, Plastic Line, Polymer Group

¹ Piboonbumpen Demonstration School, Burapha University

² Science Classrooms in University-Affiliated School Project, Science Burapha University

*Corresponding author email: boonsong@go.buu.ac.th

Development of tamarind sauce and spicy sauce for ready-to-eat fried chicken with consumption convenience

Chunkamol Panyayong^{1,*} Nattakan Sricharoen¹

This research aimed to develop tamarind and spicy sauce products for ready-to-eat fried chicken with consumption convenience for commercialization. The objectives were 1) to develop tamarind sauce and spicy sauce products and study consumer acceptance and 2) to determine the shelf life of the products. A simple random sampling of 50 general consumers was selected for the study. The results showed that 1) the characteristics of tamarind and spicy sauce products are in accordance with the community product standards for fruit and vegetable sauce, and chili sauce, the overall consumer acceptance of tamarind sauce and spicy sauce products was high (3.71 ± 0.92 and 4.27 ± 0.77 , respectively) and the overall acceptance of spicy sauce was higher than tamarind sauce significant at the 0.05 level, and 2) the shelf life of tamarind sauce and spicy sauce products stored in PP plastic bottles at room temperature of 30°C was more than 60 days, as no harmful microorganisms were found at normal temperature conditions (total bacteria count <10 cfu/g and total yeast and mold count <10 cfu/g).

Keywords: Ready-to-Eat Fried Chicken with Consumption Convenience, Spicy Sauce, Tamarind Sauce

¹ Faculty of Science and Technology, Uttaradit Rajabhat University, Uttaradit 53000

*Corresponding author, email: chunkamol.pan@uru.ac.th

Oral Presentation

กลุ่มที่ 8 Routine to Research

Development of information system for management research project fund of science faculty, Naresuan University

Suchila Phumyoo^{1,*}

This research aimed to develop an information system for the academic staffs responsible for the research projects were supported by funding from the Faculty of Science, Naresuan University. E-book was designed using Google Sites and Canva, which are freeware, An infographics timeline showed the design of categories that can access template forms and example files easily. The operation of project submission, installment disbursement, budget disbursement along with relevant rules and regulations, the extension of project operating time, closing the project, and delivering the interest were prepared for the grantees to use as a guideline correctly. An information system can be immediately evaluated via Google Forms to develop to respond the users' needs. The system evaluated user satisfaction using statistics to analyze the data, including percentage, mean, and standard deviation. The population in this study was 51 users out of the 80 recipients of funding, representing 63.75 percent. The study indicated that users were satisfied with the system. The mean satisfaction of contact and coordination channel was 4.69, followed by a collection of files into categories to reduce the time needed to find document files (The mean was 4.66), respectively. The overall satisfaction level showed the highest average at 4.64, (S.D.=0.54)

Keywords: Faculty of Science, Government Budget, Grant Manual, Information System, Naresuan University, Research Project

¹ Faculty of Science, Naresuan University, Phitsanulok, 65000

*Corresponding author, email: suchilap@nu.ac.th

The development and database system for risk management and internal control
Faculty of Science University of Phayao

Sita Thianwan^{1,*}

The objectives of this study are 1) to develop guidelines for document storage of risk management and internal control; 2) to develop a database system for document storage of risk management and internal control. This study created a risk management and internal control database system of the Faculty of Science, University of Phayao (RMSCI-PLAN), that supports data collecting for risk management and internal controls strategies. Report the performance according to the risk management and internal control plan (RM-Plan) for 6 months and report on the performance according to the risk management and internal control plan (RM-R12) for the period of 12 months are used for management and is a source of information for systematic storage. This database system is created as a web database on a network using the computer language Microsoft SQL Server 2014. Experimenting with the database system, the findings demonstrate that the system works well, is accurate and reliable, provides convenient and secure database access, and can correctly and rapidly present performance reports based on strategies planned for risk management and internal control.

Keywords: Database System, Internal Control, Risk Management

¹ Faculty of Science, University of Phayao, Phayao, 65000

*Corresponding author, email: sita.th@up.ac.th

A study of motivation to study at the Faculty of Science, Mahasarakham University

Anunsa Tonglao^{1,*}

This research aims at studying the factors affecting motivation for choosing to study for the bachelor's degree in the Faculty of Science at Mahasarakham University. The participants were the first-year undergraduate students in the Faculty of Science at Mahasarakham University, comprising 537 students in the academic year of 2019 and 171 students in the academic year of 2020. The research instrument was a questionnaire. Descriptive statistics were used to analyze the data, including frequency, percentage, mean, and standard deviation. The results showed that the four main factors affecting students' motivation were as follows: 1) Faculty members have their expertise and competencies recognized throughout ($\bar{X} = 4.36$, $SD = 0.70$), 2) students have interests in the field of study offered ($\bar{X} = 3.91$, $SD = 0.83$), 3) students need to study at a famous university in the northeastern region ($\bar{X} = 3.80$, $SD = 0.79$), and 4) the atmosphere and environment in the Faculty of Science are pleasant to study ($\bar{X} = 3.64$, $SD = 0.71$). In addition, it was found that there are 6 provinces where students are most likely to study at the Faculty of Science, namely Maha Sarakham, Khon Kaen, Roi Et, Kalasin, Udon Thani, and Nakhon Ratchasima. From the data obtained, it was revealed that the key factors for providing educational guidance to educational institutions in the target provinces mentioned are to promote a modern curriculum, faculty members' expertise, the university's reputation, and a pleasant atmosphere.

Keywords: Faculty of Science, Motivation to Study

¹ Faculty of Science, Mahasarakham University

*Corresponding author, email: anunsa.t@msu.ac.th

Poster Presentation

กลุ่มที่ 1 สาขาวิชาชีววิทยาและการประยุกต์

วิทยาศาสตร์การประมง

วิทยาศาสตร์สิ่งแวดล้อม วิทยาศาสตร์การเกษตร

วิทยาศาสตร์สุขภาพ จุลชีววิทยา วิทยาศาสตร์

เทคโนโลยีชีวภาพ

วิทยาศาสตร์และเทคโนโลยีทางอาหาร

Differences of ischemic and ischemia/reperfusion injury related protein damage-associated molecular pattern (DAMPs) in cardiac cell subjected to an *in vitro* simulated ischemia/reperfusion injury.

Sarawut Kumphune^{1,2}, Pornthanate Sinak^{2,3}, Worawat Songjang^{2,4}, Arunya Jiraviriyakul^{2,4}, Noppadon Jumroon^{2,4}, Panyupa Pankhong^{2,4}, Sittiruk Roytrakul⁵ and Nitirut Nernpermpisooth^{2,3,*}

Damage-associated molecular patterns (DAMPs) are intracellular molecules that are released from cells that undergoes to the injury. These molecules could be divided into 2 major categories including intracellular proteins or protein-DAMPs and Non-protein DAMPs. Protein-DAMPs is abundant biomolecules that could potentially be a novel biomarker for the pathology. Myocardial Ischemia/Reperfusion (I/R) injury is a causative process for ischemic heart disease, which now become the cause of global death. An early diagnosis is necessary to save patients' life. Therefore, discovery of new early cardiac biomarkers is challenging. Here, we examine the protein-DAMPs expression in early periods in comparison with ischemia/reperfusion. Rat cardiac myoblast (H9c2-2) cell line was subjected to ischemia condition or ischemia followed by reperfusion. The ischemic condition was performed by incubating cells with simulated ischemic buffer, while reperfusion was performed by replacing with fresh complete medium at the end of ischemia. The results showed that cell viability was reduced in time dependent manner in both ischemic or ischemia/reperfusion injury, which related to the released-lactate dehydrogenase (LDH) activity. At the end of ischemic period, the ischemic buffer was collected, as well as the complete medium collection at the end of reperfusion. The protein concentration and protein pattern were also determined by colorimetric protein assay and SDS-polyacrylamide gel electrophoresis, respectively. The results showed that there was an increase in protein level in time dependent manner in both ischemia or ischemia/reperfusion injury. The identification of protein will be further performed by proteomic techniques to identify novel early cardiac biomarkers for ischemic heart disease.

Keywords: Biomarker, Damage Associated Molecular Patterns (DAMPs), Diagnosis, Myocardial Ischemia/Reperfusion,

¹ Biomedical Engineering Institute, Chiang Mai University, Chiang Mai, 50200

² Integrative Biomedical Research Unit (IBRU), Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

³ Department of Cardio-Thoracic Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁴ Department of Medical Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁵ National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, 12120

* Corresponding author email: nitirutn@nu.ac.th

Expression of age-related microRNAs in venous blood

Paweena Mukda¹, Hathaichanoke Boonyarit² and Kunlaya Somboonwiwat^{1,*}

In the investigation of criminal suspects, age estimation is essential in the practice of forensic science. The ability to quickly narrow down a group of suspects and prosecute cases can benefit officers if the age is accurately estimated. The biological evidence at a crime scene is typically blood or stains. Currently, standard DNA profiling (STR analysis) is used to establish a link between biological evidence and a suspect in a criminal investigation, but not age estimation. MicroRNAs (miRNAs) are small RNAs that are responsible for regulating gene expression and have been shown to be a potential biomarker. Because RNA is easily destroyed, the unsuitable environment on the scene affected the quality and stability of the RNA in the sample. Exosomal miRNAs (exomiRs) are miRNAs stored within the exosome. Thus, these miRNAs are more stable than the miRNAs found in the circulating blood. Unlike circulating miRNAs, exomiRs are considered a good source for biomarkers owing to their advantages in terms of quantity, quality, and stability. Therefore, this research aims to study the expression of age-related microRNAs in venous blood, both whole blood and bloodstain, selected from previous reports by Noren Hooten et al. (2010) and (2013). Eight age-related miRNAs were selected and further searched against the human EVmiRNA database. Six of them (hsa-miR-107, hsa-miR-103, hsa-miR-130a, hsa-miR-24, hsa-miR-221, and hsa-miR-181a-5p) are exomiRs, whereas the other two (hsa-miR-1248 and hsa-miR-1538) are circulating miRNAs. The miRNA expression profile in the whole blood or bloodstain was analyzed in Thai populations at the age ranges of 15–35 and 36–60 years old using qRT-PCR. Seven miRNAs, including hsa-miR-107, hsa-miR-103, hsa-miR-130a, hsa-miR-221, hsa-miR-181a-5p, hsa-miR-1248, and hsa-miR-1538, showed significantly different expression between tested age ranges. As compared to circulating miRNA, exomiRs demonstrated better RNA stability in long-term storage, suggesting that they have potential for forensic applications.

Keywords: Age estimation, Age-related microRNA, Biological evidence, Biomarker, Exosomal RNA

¹ Department of Biochemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330 Thailand

² Institute of Forensic Medicine, Police General Hospital, Bangkok 10330 Thailand

* Corresponding author, e-mail: kunlaya.s@chula.ac.th

LPS-stimulated vascular endothelial cell injury related damage-associated molecular pattern (DAMPs) expression

Panyupa Pankhong^{1,2,*}, Worawat Songjang^{1,2}, Noppadon Jumroon^{1,2}, Arunya Jiraviriyakul^{1,2}, Nitirut Nernpermpisooth^{1,3}, Porrnthanate Sinak^{1,3}, Sarawut Kumphune^{1,4} and Sittiruk Roytrakul⁵

Sepsis is an important public health problem with a high mortality rate caused by a dysregulated host immune response to infection. One of the important hallmarks of sepsis is vascular endothelial cell injury, which leads to multiple organ failure and death. The early biomarkers for sepsis are urgently needed. Damage-associated molecular patterns (DAMPs) are host nuclear or cytoplasmic non-microbial molecules released from the cell following tissue injury. DAMPs could potentially be a novel biomarker in sepsis. This study examines the protein-DAMPs expression in early periods of sepsis. Human umbilical vein endothelial cell line, EA.hy926, was stimulated by low and high dose of lipopolysaccharide (LPS) for 24, 48, and 72 hours. The results showed that cell viability was reduced in time-dependent and dose-dependent manners. Cell injury was confirmed by the significant increment of lactate dehydrogenase (LDH) activity within 24 hours in cell conditioned medium. The supernatant of LPS-stimulated cells at different time points within 24 hours was collected. SDS-PAGE demonstrated the increment of protein bands of approximately 70 kDa in the supernatant from LPS-stimulated samples in a time-dependent manner. These proteins and the secreted protein-DAMPs in the supernatant will be further characterized by proteomic techniques to identify the novel early biomarkers associated with sepsis.

Keywords: Biomarker, Damage-Associated Molecular Patterns (DAMPs), Endothelial Cell, Lipopolysaccharide, Sepsis

¹ Integrative Biomedical Research Unit (IBRU), Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

² Department of Medical Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

³ Department of Cardio-Thoracic Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁴ Biomedical Engineering Institute, Chiang Mai University, Chiang Mai, 50200

⁵ National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, 12120

* Corresponding author email: panyupap@nu.ac.th

**Cardiac microvascular endothelial-associated protein damage-associated
molecular pattern (DAMPs) expression in ischemia
and Ischemia/Reperfusion Injury**

Sarawut Kumphune^{1,2}, PORNTHANATE SINAK^{2,3}, Worawat Songjang^{2,4}, Noppadon Jumroon^{2,4},
Panyupa Pankhong^{2,4}, Sittiruk Roytrakul⁵, Arunya Jiraviriyakul^{2,4} and Nitirut Nernpermpisooth^{2,3,*}

Damage-associated molecular patterns (DAMPs) are endogenous danger molecules that passively release from necrotic and damaged cells. DAMPs are associated with cellular inflammation and cell death pathways. The ischemia/reperfusion (I/R) induced DAMPs in microvascular endothelial cells are needed to be intensively studied to find alternative therapeutics. Therefore, we aim to investigate human cardiac microvascular endothelial-associated protein DAMPs expression in ischemia and IR injury. Human cardiac microvascular endothelial cells (hCMECs) were exposed to simulated ischemic buffer (for 60 mins), followed by reperfusion treating the cells with fresh media (for 6 hrs). The culture media from the experiment were collected, ran on an electrophoresis gel for protein detection by Coomassie blue staining. The results show that the I/R media contain three bands: at around 45, 100, and 180 kDa. However, the media collected under the ischemic condition have the 70 kDa protein band. These proteins will be extracted and further characterized by LC-MS/MS to find the association with DAMPs molecules to emerge as a novel diagnostic biomarker and new therapeutic targets for patients with coronary artery disease.

Keywords: Biomarker, Damage Associated Molecular Patterns (DAMPs), Human Cardiac Microvascular Endothelial Cells (hCMECs), Ischemia/Reperfusion Injury

¹ Biomedical Engineering Institute, Chiang Mai University, Chiang Mai, 50200

² Integrative Biomedical Research Unit (IBRU), Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

³ Department of Cardio-Thoracic Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁴ Department of Medical Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁵ National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, 12120

* Corresponding author email: nitirutn@nu.ac.th

Change of exosomal miR-146a expression in blood affects to inflammatory cytokines production by regulating via TRAF6 and IRAK1 of pediatric SLE following treatment

Aunyamon Srichaimongkol¹, Poorichaya Somparn^{2,3,*}, Marut Tangwattanachuleeporn¹,
Bunsita Wanthong¹ and Suwaphit Jungjing¹

miR-146a is a short nucleotide that regulates mRNA expression and plays an important role in SLE, via regulation of the type I Interferon (IFN) signaling pathway. Thus, this study investigated the expression of exosomal miR-146a, which affects IFN gene expression by targeting TRAF6 and IRAK1 genes in pediatric SLE patients following treatment, divided into three groups: before treatment at 0 months, non-response at 3 months, and response at 6 months. Blood sample was collected from 12 pediatric SLE patients at 0, 3, and 6 months then exosomes were purified from plasma by ExoQuick Exosome Precipitation Solution for quantification. miR-146a extracted by miRNeasy serum/plasma kit and mRNA extracted from peripheral blood mononuclear cells (PBMCs) by QIAGEN RNeasy MINI kit. miR-146a, TRAF6, IRAK1, and IFN expression were analyzed by qRT-PCR. Compared with before treatment, the non-response group, and the response group, exosome levels were significantly reduced, and miR-146a expression was significantly increased while miR-146a expression was inconsistent with targeting TRAF6 and IRAK1 expression. TRAF6 and IRAK1 expression in the response group were significantly increased from before treatment. Type I IFN expressions were increased in the response group compared to before treatment and non-response. We conducted a correlation analysis between miR-146a expression and clinical parameters and showed a correlation to a kidney disorder that is common in SLE. Thus, miR-146a could provide a useful prognosis in treatment response, but increased miR-146a expression does not play a critical role in the response TRAF6 and IRAK1 genes that signal for type I IFN signaling pathway.

Keywords: IRAK1, miR-146a, Systemic Lupus Nephritis, TRAF6, Type I IFN

¹ Faculty of Allied Health Sciences, Burapha University, Chon Buri 20130, Thailand

² Center of Excellence in Systems Biology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

³ Center of Excellence on Translational Research in Inflammation and Immunology (CETRII), Department of Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

* Corresponding author email: poorichaya.s@chula.ac.th

Development of texture-modified Barbecued Red Pork in Sauce with Rice for post-stroke patients with dysphagia

Teerut Umprecha^{1,*} Aussama Soontrunnrudsri¹ and Siwaporn O'Charoen¹

Inappropriate food characteristics for post-stroke patients with dysphagia are a major cause of malnutrition, lung infection, and death. The study aims to develop texture-modified food with appropriate texture, nutritional value, and safety for stroke patients with dysphagia. First, the behaviors and attitudes of those involved in food preparation for stroke with dysphagia patients were studied. It was found the food should be similar to the available food that is delicious and safe. The Barbecued Red Pork in Sauce with Rice substituting salty seasoning with spices for 25, 50, 75, and 100% sensory evaluation showed that the liking score of the recipe with 50% spices substitution was not different from the standard recipe. So, the 50% spices substitution formula was selected for the texture modification study by carboxymethylcellulose: (CMC) was added in different proportions, hommati brown rice, barbecued red pork, gravy, and cucumber at the percentages of 2, 1.5, 3.5, and 2.5 (weight/weight) were suitable according to the standard. International Dysphagia Diet Standardization Initiative (IDDSI) Level 4. CMC caused an increased hardness, cohesiveness, and adherence to food, and change the color value of gravy changed. Sodium content and salt content were analyzed. The result showed this meal contained 163.06 mg/100 g sodium and 0.16 g/100g salt. Texture-modified barbecued red pork in sauce with rice with a 50% sodium-reduced was suitable for stroke patients with dysphagia according to IDDSI Level 4 standards.

Keywords: DASH Diet, Dysphagia, Stroke and Texture-modified Diet

¹ Department of Product Development, Faculty of Agro-Industry, Kasetsart University, Bangkok, 10900

* Corresponding author email: umprecha.teerut@gmail.com

Characterization of breast cancer stem-like cells derived from MDA-MB-231, a triple-negative breast cancer cell

Natnicha Rangsiyanon¹, Phosathorn Mutapat², Jisnuson Svasti² and Voraratt Champattanachai^{1, 2,*}

Triple-negative breast cancer (TNBC) is an aggressive type of breast cancer that is difficult to cure. Loads of evidence suggest that TNBC has a much-enriched population of breast cancer stem cells. In this study, we aim to characterize the properties of MDA-MB-231-mammospheres (MDA-mammospheres), a non-adherent TNBC cell line with having stem-like cell phenotypes. Gene expression levels were measured by real-time reverse transcription polymerase chain reaction (RT-PCR). The results showed that the MDA-mammospheres had high expression levels of stemness genes and could redifferentiate to the parental morphology of MDA-MB-231. In addition, our proteomics data revealed that Anterior Gradient 2 Protein Homolog (AGR2), a chaperone protein that functions as a protein disulfide isomerase (PDI), was highly upregulated in MDA-mammospheres. Using RT-PCR, we found that the gene level of *ARG2* was immensely increased while the level of *P4HB*, which codes for the beta subunit of prolyl 4-hydroxylase, another enzyme in PDI family, was unchanged at the first to ninth passage cultures of MDA-mammospheres compared to that of MDA-MB-231. As a result, we moved forward to investigate the roles of *AGR2* using RNA interference. The effects of *AGR2* knockdown in MDA-mammospheres were investigated and discussed. More data are needed to be performed; however, these preliminary results suggest that *AGR2* might be considered as a potential target for TNBC stem-like cells.

This work was supported by Chulabhorn Graduate Institute, Chulabhorn Royal Academy (Chulabron Graduate Scholarship Commemorating the 84th Birthday Anniversary of His Majesty King Bhumibol Aduyadej the Great) and Thailand Science Research and Innovation (TSRI), Chulabhorn Research Institute (Grant No. 3682/4274652).

Keywords: Anterior Gradient 2 Protein Homolog, Breast Cancer Stem-like Cells, Mammospheres, RNA interference

¹Applied Biological Science: Environmental Health, Chulabhorn Graduate Institute, Chulabhorn Royal Academy, Bangkok, Thailand

²Laboratory of Biochemistry, Office of Research, Chulabhorn Research Institute, Bangkok, Thailand

* Corresponding author email: voraratt@cri.or.th

Expression profiles of cluster of differentiation 47 and calreticulin in breast cancer tissues and cell lines

Phattarin Pothipan¹, Juthamard Chantaraamporn¹, Lalita Lumkul², Titipatima Sakulterdkiat³,
Burana Khiankaew⁴, Jisnuson Svasti¹ and Voraratt Champattanachai^{1,*}

Cluster of differentiation 47 (CD47) is overexpressed on various types of cancer and serves as a ligand for signal regulatory protein- α (SIRP- α) on macrophages. The binding of CD47-SIRP- α transmits an anti-phagocytic signal protecting cancer from immune surveillance. In contrast to CD47, calreticulin (CALR) on the surface of cancer cells is considered as a pro-phagocytic signal. However, the role of both CD47 and CALR remain incompletely understood in breast cancer. This study aims to investigate the expression and clinical significance of CD47 and CALR in breast cancer and normal breast tissues using immunohistochemistry. The expression levels of both CD47 and CALR were found to be higher in breast cancer tissues than in normal tissues. Furthermore, the associations between CD47/CALR expression and hormone receptor subtypes were elucidated. Patients with ER+, PR+, HER2- breast cancer had highest levels of CD47 but lowest levels of CALR expression compared to those with other subtypes, while patients with triple negative breast cancer (TNBC) had lowest levels of CD47 but highest levels of CALR expression. Moreover, we checked basal levels of CD47 and CALR in two breast cancer cell lines, including MCF-7 (ER+, PR+, HER2-) and MDA-MB-231 (TNBC). The results showed that the expression profiles of the two proteins and hormone receptor subtypes observed in breast cancer tissues are also reflected in these cell line models. Our findings suggested that manipulation of the balance between CD47 and CALR expression could be considered as a macrophage-based therapeutic strategy for breast cancer. Supported by TSRI, CRI (Grant No. 36821/4274352).

Keywords: Breast cancer, Calreticulin, Cluster of differentiation 47, Immunotherapy

¹ Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok, 10210

² Applied Biological Sciences Program, Chulabhorn Graduate Institute, Bangkok, 10210

³ Department of Pathobiology, Faculty of Science, Mahidol University, Bangkok, 10400

⁴ Department of Pathology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, 10400

* Corresponding author email: voraratt@cri.or.th

Genetic variants of the phenylalanine hydroxylase gene in Thai patients with phenylketonuria

Lukana Ngiwsara^{1,*}, Phannee Swangareetakul¹, Somporn Liammongkolkul², Pisanu Ratanarak², Chantragan Srisomsap¹, Voraratt Champattanachai¹, James Ketudat-Cairns^{1,3}, Pornswan Wasant², Jisnuson Svasti¹ and Nithiwat Vatanavicharn²

Phenylalanine hydroxylase (PAH; EC1.14.16.1) is a key enzyme in the metabolism of phenylalanine (Phe), converting Phe to tyrosine (Tyr). PAH deficiency is the primary cause of the metabolic phenotypes phenylketonuria (PKU) and hyperphenylalaninemia (HPA). In this study, we described the heterogeneity of PAH variants found in the Thai population as well as evaluated enzyme activity and the expression of novel variants. PAH genes from 13 patients were analyzed by PCR amplification and direct Sanger-sequencing of all exonic regions. Eleven different PAH variants were identified: all pathogenic variants were missense variants, of which the most frequent variant was p.R169L, accounting for 24% of all identified alleles. Two novel variants, p.R169L and p.Y317N, and previously reported variants with mutated residues at the same positions (p.R169H and p.Y317H) were expressed in COS-7 cells. These showed mildly impaired residual activity while the proteins were well expressed, except for p.R169L, which showed decreased protein expression of 55.7% compared to the wild type enzyme. All patients with p.R169L identified in at least one of the pathogenic alleles (one case is homozygous) have a metabolic phenotype of mild hyperphenylalaninemia (HPA). Our data has expanded the information on the genetic heterogeneity of Thai patients with PAH deficiency. This finding emphasizes the importance of genotyping in patients with HPA, and *in vitro* studies can provide additional information for the prediction of phenotype.

This work was supported by Thailand Science Research and Innovation (TSRI), Chulabhorn Research Institute (Grant No. 2536704/42292).

Keywords: *in vitro* expression, PAH variants, Phenylalanine hydroxylase, Phenylketonuria

¹ Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok, 10210

² Division of Medical Genetics, Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700

³ School of Biochemistry, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, 30000

*Corresponding author email: Lukana@cri.or.th

Effect of health-related fitness and arterial stiffness on smokers: comparison of exercise and non-exercise

Phimphaka Saengbun¹, Yueiji Tanaka¹ and Pattawan Lapo^{1, *}

Chronic smoking is a risk factor for increased arterial stiffness, and cardiovascular disease leads to the most significant percentage of mortality. Regular aerobic exercise improves the circulatory system and is associated with reduced arterial stiffness. This study is to determine the influence of exercise on health-related fitness and arterial stiffness in male smokers. The study population consisted of 19 men (aged 26-55 years) working at the University of Phayao. Six male smokers who had exercised were compared with six male smokers who not exercise and seven male non-smokers who had non-exercised. Physiological characteristics, physical fitness includes body composition, flexibility, lung capacity, muscle strength, muscle endurance, and maximal oxygen consumption. Arterial stiffness was assessed by brachial-ankle pulse wave velocity (baPWV). There were no significant group differences in weight, body fat percentage, resting heart rate, diastolic blood pressure, flexibility, lung capacity, muscle strength, and arterial stiffness. Systolic blood pressure and muscle endurance were greater in male smokers who exercised than in male non-smokers who did not exercise. Male smokers who exercised demonstrated greater maximal oxygen consumption than both male smokers and male non-smokers who did not exercise (41.73 ± 4.40 ml/kg/min, 34.67 ± 3.67 ml/kg/min and 33.56 ± 4.46 ml/kg/min, respectively) ($p < 0.05$). Regular aerobic exercise maintains health-related fitness and arterial stiffness. Smokers combine exercise training regularly may help slow the onset of cardiovascular diseases.

Keywords: Arterial Stiffness, Exercise, Health-related Fitness, Smoking

¹ Program of Exercise and Sport, School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: pattawan.la@up.ac.th

Development of anti-bacterial and anti-cancer peptides from the helminth defense molecule of the liver fluke *Opisthorchis viverrini*

Kamonrut Kongpha^{1,*} Sutas Suttiaprapa^{2,3} and Marut Laohaviroj^{1,2}

Helminth defense molecules (HDMs) are secreted by parasitic flatworms. HDMs showed immunomodulatory activity by suppressing LPS-induced inflammatory response. Modified HDM from the liver fluke *Fasciola hepatica* showed anti-bacterial and anti-cancer activities. This study aims to evaluate the activity of OvHDM of *Opisthorchis viverrini*. The OvHDM, modified OvHDM, modified FhHDM-1 and LL37-fragment were tested against bacteria and cancer cells. The broth microdilution was used to measure anti-bacterial activity against *Escherichia coli* and *Staphylococcus epidermidis*. We found that OvHDM and modified OvHDM exhibited no anti-microbial effect. In contrast, modified FhHDM-1 showed effect to against *E. coli* and *S. epidermidis* at 12.5 and 3.12 μM , respectively. Moreover, it showed bactericidal to *E. coli* and *S. epidermidis* at 50 and 25 μM , respectively. Likewise, the LL-37 fragment inhibited *E. coli* and *S. epidermidis* at 25 and 50 μM respectively. Moreover, the LL-37 fragment showed a bactericidal effect against *E. coli* at 100 μM . however, but not on *S. epidermidis*. The MTT assay was used to observe cytotoxicity on KKU100 (CCA) and H69 (normal cells). The result showed that OvHDM and modified OvHDM did not affect both cells. However, modified FhHDM-1 and LL-37 fragments displayed a killing effect on KKU100 but not on H69 cells with EC_{50} at 11 and 33.8 μM , respectively. In conclusion, HDM and modified HDM from *O. viverrini* showed no anti-microbial and anti-cancer activities. Further studies are required to develop the anti-cancer and anti-bacterial peptides from the liver fluke *O. viverrini* HDM as it has been successful for *F. hepatica*.

Keywords: Anti-cancer Peptides, Anti-microbial Peptides, Helminth Defense Molecules, *Opisthorchis viverrini*

¹ Department of Microbiology, Faculty of Medicine, Khon Kaen University, Khon Kaen, 40002

² Department of Tropical Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand, 40002

³ WHO Collaborating Centre for Research and Control of Opisthorchiasis (Southeast Asian Liver Fluke Disease), Tropical Disease Research Center, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand, City, Country, 40002

* Corresponding author email: kamonrut.ko@kkumail.com

Development of chicken IgY-based indirect ELISA for detect *Opisthorchis viverrini* antigen in feces

Sokuntheary Oeurn^{1,*}, Sutas Suttiaprapa¹, Banchob Sripa¹ and Prasert Saichua¹

The human liver fluke is a significant public health concern affecting over 600 million individuals worldwide. Efforts to control liver fluke infection in the Greater Mekong Subregion are ongoing, and include public health education campaigns, improved sanitation and hygiene, and the use of anthelmintic drugs to treat infected individuals. However, more needs to be done to address this significant public health concern and reduce the burden of liver fluke infection including new diagnostic method development. Despite efforts to develop more sensitive and specific detection methods, diagnosis is still largely based on traditional stool examination. In this study, we developed an indirect ELISA using anti- *O. viverrini* cathepsin F (rOv-CF) IgY antibody to detect *O. viverrini* antigen in human stool. We used the TCA stool processing method to prepare the OV-somatic antigen spiked stool to analyze. As a result, all standard curves of this indirect ELISA are parallel which indicate this method is reliable and consistent for measuring OV-somatic antigen concentration in human stool ($R^2=0.99$, $P=0.987$) with limit of detection of 2.2 $\mu\text{g/ml}$ (OV-somatic antigen). The study can be the base line for further research of OV antigen detection in human stool, and use for screening *O. viverrini* infection in endemic area in the further.

Key words: Chicken IgY, Indirect ELISA, *Opisthorchis viverrini*

¹Department Tropical Medicine, Faculty of Medicine, Khon Kaen University

*Corresponding author, email: sokuntheary.o@kkumail.com

Molecular characterization and functional analysis of the *Opisthorchis viverrini* calpain

Sunheng Kaing^{1,*}, Sujitra Chaiyadet², Prasert Saichua² and Sutas Suttiprapa^{2,*}

Opisthorchiasis caused by *Opisthorchis viverrini* (Ov) is an important parasitic foodborne disease in many parts of Southeast Asia including Thailand, Lao PDR, Vietnam, and Cambodia. Chronic infection is associated with several hepatobiliary diseases, especially gallbladder and bile duct inflammation (cholecystitis and cholangitis), periductal fibrosis, and cholangiocarcinoma, the fatal bile duct cancer. The mechanism by which this carcinogenic liver fluke induce chronic infection is currently unclear. This study was aimed to characterize and functional analysis of calpain, a tegumental protein of Ov. We evaluated the functional activity of calpain via hydrolysis of fluorogenic peptides and biological substrates. Enzymatic activity of native calpain in the crude somatic extracts was tested against calpain specific fluorogenic peptide substrate *N*-succinyl-Leu-Leu-Val-Try-7-amino-4-methylcoumarin (AMC) calpain in assay buffer (100mM sodium acetate, 100 mM NaCl, 5 mM CaCl₂ and 1 mM dithiothreitol, pH 2,3,4.5,5.5 or 100mM Tris-HCl, 100 mM NaCl, 5 mM CaCl₂ and 1 mM dithiothreitol, pH 6.5,7.5,8.5,9.5). For inhibitory assay, somatic worm extracts protein was pre-incubated at 25°C for an hour with assay buffer at pH 4.5 with each protease inhibitors (100 μM E64, 5 mM EDTA, and 1 mM protease inhibitor cocktail), before adding the substrate. The enzymatic activity assay was measured by monitoring the release of fluorescence (AMC) upon hydrolysis of substrate at 37°C for 60 min with 10 min interval using a fluorometer at 360 nm excitation and 460 nm emission. The result showed the maximum activity of calpain was at pH 4.5, which is different from other protease of Ov that has been studied to date. The proteolytic activity was inhibited by EDTA, protease inhibitor, and E64. In addition, it digested mouse IgG, human hemoglobin, and human plasma fibronectin, which suggested its function in immune evasion and nutrient acquisition.

Keywords: *Opisthorchis viverrini*, Calpain, Characterization, Functional Analysis

¹ M.Sc. student in Tropical Medicine Graduate Program, Department of Tropical Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, 40002, Thailand

² Department of Tropical Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, 40002 Thailand

* Corresponding author email: sutasu@kku.ac.th, kaingsu@kkumail.com

Elucidating the hepatotoxic mechanism of the insecticide fipronil in human hepatocellular carcinoma cells using the proteomic approach

Theetat Ruangjaron^{1,2}, Phichamon Phetchahwang², Daranee Chokchaichamnankit²,
Chantragan Srisomsap², Sombat Singhakaew³, Puey Ounjai³, Kriengsak Lirdprapamongkol^{2,*},
Jisnuson Svasti² and N. Monique Paricharttanakul²

Insecticides can enter the body through several routes, including ingestion, inhalation, and adsorption. The liver is the major organ exposed to the presence of insecticides in the bloodstream. Therefore, the role of insecticides as hepatotoxicants should be considered. Fipronil is an insecticide widely used in households and agriculture and is considered an environmental contaminant. The effect of fipronil on the mitochondrial function of neuronal cells has been reported. This study aims to use the proteomic approach to elucidate the hepatotoxic mechanisms involved in the mitochondrial dysfunction caused by fipronil in HepG2 hepatocellular carcinoma cells. After 48 hours of exposure, cells treated with fipronil at concentrations greater than 50 μM displayed morphological changes, as shown by loss of contact with neighboring cells and assumption of a round shape. Fipronil at an IC50 value concentration of 36 μM caused a 20% reduction in ATP levels compared with the control. Proteomic analysis of HepG2 cells treated with 36 μM fipronil revealed differential expression of mitochondrial proteins involved in energy metabolism and mitochondrial activity. Immunoblot analysis confirmed that fipronil could decrease the expression of a mitochondrial protein, ATP synthase subunit beta (ATPB), in HepG2 cells. In conclusion, our study demonstrated the mechanism for fipronil-induced hepatotoxicity by downregulation of ATPB expression, which leads to mitochondrial dysfunction and ATP depletion.

This research was supported by the Thailand Science Research and Innovation (TSRI), Chulabhorn Research Institute, grant number 2536704/42293.

Keywords: Environmental contaminants, Hepatotoxicity, Insecticide, Mitochondria, Proteomics

¹ Chulabhorn Graduate Institute, Chulabhorn Royal Academy, Bangkok 10210, Thailand

² Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok 10210, Thailand

³ Department of Biology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

* Corresponding author email: kriengsak@cri.or.th

Cigarette smoke extracts induces lung epithelial cell death and alters lung secretomes expression

Pornthanate Seenak^{1,2,*}, Nitirut Nernpermpisooth^{1,2}, Sarawut Kumphune^{1,3}, Worawat Songjang^{1,4}, Noppadon Jumroon^{1,4}, Panyupa Pankhong^{1,4}, Arunya Jiraviriyakul^{1,4} and Sittiruk Roytrakul⁵

Recently, the World Health Organization has been reported that cigarette smoking is the leading cause of mortality and morbidity worldwide. Cigarette smoking is a major risk factor for cardiovascular diseases and respiratory diseases. Additionally, cigarette smoking can disrupt the function and structure of respiratory epithelial cells and also cell death. Smoking can induce secretomes released from injured respiratory epithelial cells (A549 cell line). However, the study of secretomes is not fully investigated. This study aims to study the secretome from respiratory epithelial cells exposed to cigarette smoke extract (CSE). A549 was treated with or without CSE at different concentration and time. The results showed that respiratory epithelial cells exposed to 10% of CSE for 12 hours had significantly increased the mortality rate and necrosis cell death. For determining the secretomes expression, the culture medium of respiratory epithelial cells were collected, followed by SDS-polyacrylamide gel electrophoresis. The results showed that CSE induced secretomes alteration when compared to the control group. Therefore, the current study suggests the CSE contributes to respiratory cell death in a dose-time dependent manner. The verification of secretomes expression by using HPLC-MS/MS techniques should be performed to annotate a novel biomarker for monitoring and diagnosis of respiratory diseases-related CSE.

Keywords: Cigarette Smoke, Respiratory Epithelial Cell, Secretome

¹ Integrative Biomedical Research Unit (IBRU), Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

² Department of Cardio-Thoracic Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

³ Biomedical Engineering Institute, Chiang Mai University, Chiang Mai, 50200

⁴ Department of Medical Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000

⁵ National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, 12120

* Corresponding author email: pornthanates@nu.ac.th

Proteomic-based study of the neurotoxic mechanism of the insecticide fipronil in a human neuroblastoma cell line

Theetat Ruangjaroon^{1,2}, Kriengsak Lirdprapamongkol^{2,*}, Daranee Chokchaichamnankit²,
Chantragan Srisomsap², Phichamon Phetchahwang², Jisnuson Svasti²
and N. Monique Paricharttanakul²

A risk factor for developing neurodegenerative disease in humans is long-term exposure to insecticides. Fipronil is a common insecticide used to control agricultural and household insect pests. Several lines of evidence from cellular and animal studies suggest an association between fipronil exposure and neurodegeneration. In this study, we aimed to use two-dimensional gel electrophoresis to investigate the mechanism underlying fipronil-induced neurodegeneration in the SH-SY5Y human neuroblastoma cell line. Cells were treated with fipronil at concentrations of IC₂₅ and IC₅₀ values (43 and 78 μ M) for 48 h. Proteomic analysis revealed alteration in the expression of proteins involved in neuronal structure and defense to oxidative stress. Immunoblot analysis confirmed increasing vimentin expression in fipronil-treated cells. Fipronil inhibited neurite outgrowth in SH-SY5Y cells. Additionally, increase intracellular superoxide was observed in the fipronil-treated cells, in a dose- and time-dependent fashion. Pretreatment with the antioxidant *N*-acetyl cysteine could reduce neurite outgrowth damage induced by the low doses of fipronil. In conclusion, our findings suggested that fipronil exposure might promote neurodegeneration by inducing oxidative stress and neurite outgrowth damage in neuronal cells.

This research was supported by the Thailand Science Research and Innovation (TSRI), Chulabhorn Research Institute, grant number 2536704/42293.

Keywords: Environmental contaminants, Insecticide, Neurodegeneration, Oxidative stress, Proteomics

¹ Chulabhorn Graduate Institute, Chulabhorn Royal Academy, Bangkok 10210, Thailand

² Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok 10210, Thailand

* Corresponding author email: kriengsak@cri.or.th

Semi-solid and 3D cultures render the chemoresistance in A549 human lung cancer cells

Siriporn Keeratichamroen^{1,*}, Thiwaree Sornprachum¹ and Jisnuson Svasti^{1,2}

The tumor microenvironment undoubtedly influences the fate of cancer cells and therapeutic responses. However, when cells are cultured in the standard 2D culture system on plastic surfaces, important signals from the tumor microenvironment are largely ignored, particularly factors influencing response to therapy. The current study described two culture models: semi-solid culture to investigate the role of ECM proteins and 3D culture to mimic the complex 3D arrangement of tumors *in vivo*. A549 cells cultured in both cell culture models exhibit G0/G1 phase arrest and decreased invasive capacity, indicating dormant cell characteristics. More importantly, cells grown in both cell culture models demonstrated increased resistance to various anticancer agents. Western blotting revealed differences in the levels of various key cancer-associated pathways in response to semi-solid culture and 3D culture compared with 2D monolayer culture. The effects of altering various signaling pathways, such as p-ERK, p-Akt, and p-STAT3, were studied to determine whether these pathways could account for the observed cell responses. Inhibiting ERK1/2 and Akt activation in A549 cells with specific inhibitors resulted in G0/G1 arrest and drug resistance similar to that observed in cells cultured in semi-solid Matrigel. These findings demonstrated that Matrigel induced drug-resistant dormancy in A549 cells, most likely by inhibiting the ERK1/2 and PI3K/Akt pathways. Notably, the STAT3 inhibitor overcomes 3D culture-induced doxorubicin and etoposide resistance. These results implicated an important role of p-STAT3 in conferring chemoresistance in 3D-cultured A549 cells, as well as the use of a STAT3 inhibitor as a potential chemosensitizer to improve drug sensitivity.

Keywords: Dormancy, Drug Resistance, Matrigel, Three-dimensional Culture, Tumor Microenvironment

¹ Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok 10210

² Program in Applied Biological Sciences, Chulabhorn Graduate Institute, Chulabhorn Royal Academy, Bangkok 10210

* Corresponding author email: siriporn@cri.or.th

Cello – oligosaccharide Production by enzymatic hydrolysis of young longan

Kanyapak Changkhaochai¹, Chutamas Maneewong^{1,*}, Pairote Wongputtisin¹
and Ekawit Threenet²

Longan is a crop that farmers want to increase the quality and price of the produce. The trimming young longan bunches will make the longan fruit larger and the price will increase. But trimming this bunch of longan results in agricultural waste. One way to add value into the young longan fruits is converting them into cello-oligosaccharides. The objective of this research was to prepare cello-oligosaccharides from young longan by enzymatic method. The conditions for cellulose extraction were optimized. Young longan was ground and extracted using different NaOH concentrations (4% and 6%), the ratio between young longan powder and NaOH were compared at 30:70 and 20:80, at 30 °C and 121 °C. The results showed that using the ratio of 30:70 with 6% NaOH resulted in the highest yield (47.07 %). Extraction at 30 °C produced lighter color of the powder extract when compared to that of 121 °C. The cellulose was hydrolyzed by cellulase into cello-oligosaccharides (COS). The reaction time and enzyme dose were optimized. It was found that using cellulase at 50 Unit/g with the incubation temperature at 45 °C for 24 hr led to the highest amount of reducing sugar and total sugar. This was to first report of using the young longan to produce COS.

Keywords: Cello-oligosaccharide, Cellulose, Extraction, Pretreatment, Young Longan

¹Program in Biotechnology, Faculty of Science, Maejo University, Chiang Mai, 50290

²Division of Chemistry, Faculty of Science, Maejo University, Chiang Mai, 50290

*Corresponding author email: chutamas_m@yahoo.com and chutamas@mju.ac.th

Antioxidant activity of osmotic – dehydrated of pineapple containing teas (*Camellia sinensis*) and herbs

Pratsanee Kongwong^{1,*}, Orathai Bunthawong and Chanya Piyatassi¹

The objective of this research was to study the quality and the comparison of antioxidant activity of osmotic – dehydrated of pineapple mixed with tea (*Camellia sinensis*) and herbs. Pineapples were soaked with 5 % (w/v) concentration of 4 herbs: safflower, roselle, ginger and butterfly pea, and 2 types of tea: green tea and oolong tea for 17 hours and dried in a hot air oven at 70 °C for 12 hours. Pineapples that have been infused with tea and herbs have moisture content, water activity, soluble solid content, titratable acid content, anti-oxidation activity total amount of phenolic compounds and the total amount of flavonoid compounds statistically different ($p \leq 0.05$). osmotic – dehydrated of pineapple mixed with green tea show the highest antioxidant activity, total amount of phenolic content and flavonoid content ($p \leq 0.05$), with values of 10.10 mg TE/g, 3.34 mg GAE/g, and 22.06 mg QE/g, respectively. Osmotic – dehydrated of pineapple mixed with roselle show the highest average score of overall liking was at 7.77 points, ranging from moderate to very like ($p \leq 0.05$).

Keywords: Antioxidant Activities, Herb, Osmotic-dehydrated Pineapple, Tea

¹Faculty of Science and Agricultural Technology, Rajamangala University of Technology Lanna Lampang, 52000

* Corresponding author email: enjoy44303413@gmail.com

Design and development database of food-derived bioactive peptides with anti-inflammatory activity

Preeyaporn Tubkaew¹ and Pitak Sootanan¹

Most dietary protein-derived peptides show anti-inflammatory activity thus helping to reduce the incidence of serious diseases such as heart disease and stroke, Alzheimer's disease, Parkinson's disease, diabetes, until death. Therefore, this research aims to design and develop a database of bioactive peptides with anti-inflammatory action. It includes a process for selecting and collecting data from reviews article, database design, creation of reporting forms under online platforms and evaluate the initial use. This database contains 16 entities (tables) and 50 attributes (fields). There are 29 bioactive peptide data derived from 16 dietary proteins in this database. These peptides acts on 6 anti-inflammatory mechanisms tested at both cellular and animal levels. This database saves time and comfortable search for information related to peptides, protein sources in foods and their mechanisms of anti-inflammatory action both at the cellular and animal levels. If the display format is improved and the amount of data is added to the database, it will enable researchers and interested parties to use it more efficiently.

Keywords : Anti-inflammatory, Database, Peptide, Protein in Food

¹Department of Biochemistry, Faculty of Science, Burapha University

*Corresponding author email: pitak@buu.ac.th

Total protein content of commercial bee pollen from northern Thailand

Phennapha Pha-or^{1,*}, Sirirat Ketsri¹, Jiranan Intakoon¹, Wanichcha Thongdee¹,
Woragun Sriprasert¹ and Tipwan Suppasat¹

Bee pollen is a bee product obtained by collecting pollen from flowering plants in the pollen basket on the hind leg of the honey bee. The bee pollen is a source of protein nutrition for worker bees within the hive. This study aims to investigate the total protein content by the Kjeldahl method and to identify the origin of flowering plant family in bee pollen from *A. mellifera* beekeeping. Twenty bee pollen samples were collected from bee farms or companies in the northern region. The results showed that the total protein content was between 17.59 ± 0.09 – $29.34 \pm 0.12\%$, represented value of $25.04 \pm 0.43\%$ in their average. And, the palynology analysis showed that each grain of bee pollen, it is almost a single pollen source (uniflora). Bee pollen may be mixed with 2 pollen sources (biflora) and several pollen sources (multiflora). In addition, the pollen analysis results indicated the flowering plant source of pollen from the pollen grains of commercial bee pollen were found total of 21 families are as follows: Aizoaceae, Amaranthaceae, Anacardiaceae, Annonaceae, Asteraceae, Berberidaceae, Coprifolioceae, Euphorbiaceae, Fabaceae, Malpighiaceae, Moelvaceae, Myrtaceae, Nelumbonaceae, Oleaceae, Poaceae, Rhamnaceae, Rubiaceae, Rutaceae, Theaceae, Typhaceae, and Verbenoaceae. In addition, flowering plant in family Fabaceae was found to be the main pollen source that may supports the high protein nutrients in these bee pollen. This study concluded that the total protein content of 20 commercial bee pollen was related with the flowering plant family and their food resource in the northern region.

Keywords : Bee Pollen, Kjeldahl Methods, Protein

¹ Program in Biology, School of Science, University of Phayao, Maeka, Mueng, Phayao 56000

*Corresponding author, email: 63203419@up.ac.th

Comparative study of antibacterial activity on skin pathogens of extracts from *Stevia rebaudiana* Bertoni leaves

Panata lawsipo^{1,2,*}, Thanyalak Trihera¹ and Jamorn Somana³

The objective of this study was to investigate the antibacterial activity of ethanolic and aqueous extracts from *Stevia rebaudiana* leaves against skin pathogens, i.e., *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Cutibacterium acnes*. The result from agar well diffusion showed that both extracts exhibited the inhibitory effect against all tested bacteria with inhibition zones ranging from 10.83 ± 0.76 to 16.16 ± 2.02 mm. For MIC determination, *C. acnes* appeared to be the most susceptible strain to the ethanolic extract with a MIC of 40 mg/ml. However, the MIC values of the aqueous extract against all tested strains could not be determined in a range of concentrations used. Overall results demonstrated the ethanolic extract from *S. rebaudiana* leaves had a higher antibacterial activity on *C. acnes* than the aqueous extract, and also indicate the potential of *S. rebaudiana* leaf extracts in developing as cosmeceuticals.

Keywords: Antibacterial Activity, Skin Pathogens, *Stevia rebaudiana* Leaf

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Unit of Bioactive Natural Compounds for Healthcare Products Development, and Centre of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University, Chonburi, 20131

³ Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, 10400

*Corresponding author email: panata@go.buu.ac.th

Antimicrobial activity on skin pathogens of ethanolic extract from spent leaves of *Stevia rebaudiana* Bertoni

Panata lawsipo^{1,2,*}, Patcharapa Suriyawong¹, Patcharin Klinpet¹ and Jamorn Somana³

Spent *Stevia rebaudiana* leaves are a massive industrial waste from stevia sweetener extraction. In order to make effective use of this waste material, the study aimed to determine the antibacterial efficacy of ethanolic extract (ES) from spent *Stevia rebaudiana* Bertoni leaves against four skin pathogens, including *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Candida albicans*, and *Cutibacterium acnes*. Antimicrobial activity was initially assessed by using agar well diffusion, then, the minimal inhibitory concentration (MIC) was determined by agar dilution method, followed by minimal bactericidal concentration (MBC) determination. The results showed that ES exhibited antimicrobial activity against all microbes tested, of which *C. acnes* was the most susceptible. An inhibition zone of ES against *C. acnes* was 15.83 ± 0.29 mm and its MIC and MBC values were 40 and 80 mg/ml, respectively. Overall results indicate that spent leaf extract from *S. rebaudiana* has antimicrobial activity on certain skin pathogens and can be a candidate for the development of antimicrobial agents that can be used in combination drug therapy or as ingredients in cosmeceuticals.

Keywords: Antimicrobial Activity, Skin Pathogens, Spent *Stevia rebaudiana* Leaves

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Unit of Bioactive Natural Compounds for Healthcare Products Development, and Centre of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University, Chonburi, 20131

³ Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, 10400

*Corresponding author email: panata@go.buu.ac.th

Antipathogenic bacteria activity of *Lactobacillus* isolated from native swine feces

Kittiya Khongkool¹, Benyapa Prakit¹, Rungravee Chiyod¹, Wankuson Chanasi²,
and Monthon Lertworapreecha^{2,*}

Lactobacillus is one of the major bacterial groups found in the gastrointestinal tract of humans and animals and are widely used as probiotics in human and livestock. They are known to produce and excrete various antimicrobial compounds against several pathogens. In this study aim to find new isolates of *Lactobacillus* that effectively inhibit the growth of pathogenic bacteria. The antibacterial activity of *Lactobacillus* spp. (124 isolates) from native swine feces were evaluated using the agar well diffusion method. A hundred and ten isolates exhibited an inhibitory effect against at least one of six tested pathogens. The cell free supernatant of *Lactobacillus* spp. showed the most effective antibacterial against *Pseudomonas aeruginosa* (107 isolates), followed by *Staphylococcus aureus* (104 isolates), enterohemorrhagic *Escherichia coli* (EHEC) (91 isolates), enteropathogenic *Escherichia coli* (EPEC) (82 isolates), *Klebsiella pneumoniae* (80 isolates) and *Salmonella enterica* ser. Typhimurium (45 isolates), respectively. The isolate LS7/5.7 showed a strong activity against *P. aeruginosa* (28 mm). Two isolates, LS2/3.7 and LS2/5.6 showed antibacterial activity against *S. aureus* with the largest zone of inhibition at 29 mm. Four isolates, LS1/5.7, LS5/2.7, LS5/3.14 and LS5/6.1, showed antibacterial activity against EHEC at a strong level (25 mm). The isolate LS2/5.6 showed antibacterial activity against EPEC at a strong level (22 mm). The isolate LS5/3.10, showed potent antibacterial activity against *K. pneumoniae* (23 mm) and the isolate LS5/2.7 displayed the greatest anti-*S. Typhimurium* activity (25 mm). The inhibitory effect produced by our isolates was due to the production of organic acid.

Keywords: Antibacterial activity, *Lactobacillus*, Native Swine Feces, Pathogenic bacteria

¹ Biotechnology program, Faculty of Science, Thaksin University, Pa Phayom, Phatthalung, 93210

² Microbial Technology for Agriculture, Food and Environment Research Center, Faculty of science, Thaksin University, Pa Phayom, Phatthalung, 93210

*Corresponding author e-mail: worapreecha@gmail.com

**The evaluation of potentials of lichens *Parmotrema tinctorum* (Despr. Ex Nyl.)
hale crude extract against biofilm formation in some species
of pathogenic bacteria**

Areerat Saison^{1,*}, Nadtiraporn Pono¹ and Khwanyuruan Naksuwankul¹

This study aims to evaluate the potential of *Parmotrema tinctorum* (Despr. Ex Nyl.) Hale crude extract with three solvents (95% ethanol, acetone, and boiling water for 30 minutes) to inhibit the pathogenic bacterial biofilm formation using Microtiter plate assay. Three species of bacteria were chosen for anti-biofilm activity test, including *Bacillus cereus* TISTR 1449, *Staphylococcus epidermidis* TISTR 2162, and *Pseudomonas aeruginosa* TISTR 1287. The results of anti-biofilm activity show at the concentration of 2.5 mg/ml in all solvents; the ethanolic extract presented the highest anti-biofilm activity of *B. cereus* with a percentage of antibiofilm with 34.80±8.04. Whereas the acetone extract and boiling water extract showed a high level of anti-biofilm activity of *S. epidermidis* and *P. aeruginosa* with percentages of antibiofilm to 45.47±10.42 and 19.91±2.98, respectively.

Keywords: Biofilm, Crude Extract, Lichens, Pathogenic Bacteria

¹ Department of Biology, Faculty of Science, Maharakham University

* Corresponding author email: 64010257004@msu.ac.th

Efficacy of *Mimosa pudica* L. and *Asystasia gangetica* (L.) T. Anderson. extracts on inhibition to *Fusarium* sp. isolated from longan leaves

Aphiwat Malar¹ and Wipawan Nunto^{1,*}

Fusarium species are well-known plant pathogens that cause severe damage to agricultural crops. Therefore, the aim of this study was to evaluate the fungicidal effects of *Mimosa pudica* L. and *Asystasia gangetica* (L.) T. Anders. extracts. The plants were extracted using the maceration method with distilled water and 95% ethanol, and the antifungal activity was examined using the poisoned food technique with plant extract concentrations of 10,000, 20,000, 30,000 and 40,000 ppm. The results revealed that all extracts, at varying concentrations, showed antifungal activity against the tested fungi. The inhibitory effect of crude plant extracts against *Fusarium* sp. was observed to increase along with the increasing concentrations of the plant extracts. The highest inhibitory effect of the crude plant extract was recorded at a concentration of 40,000 ppm. Moreover, the results demonstrated that all ethanolic extracts were more effective than the aqueous extracts. The ethanolic extract of *A. gangetica* was the most effective in inhibiting the growth of *Fusarium* sp. with a percentage of mycelial growth inhibition of 70.73% after a 7-day incubation period. Subsequently, the percentage of inhibition of the aqueous extract of *A. gangetica* and the ethanolic extract of *M. pudica* were recorded at 68.03% and 65.12%, respectively. The antifungal effect of the aqueous extract of *M. pudica* displayed weak activity with a mycelial inhibition value of less than 50%.

Keywords : Antifungal, *Fusarium* sp., Plant Extract

¹ Program in Biological Science, Faculty of Science and Technology, Chiang Rai Rajabhat University, Chiang Rai, 57100

*Corresponding author, email: Wipawan.puk@crru.ac.th

Effects of organic acids for inactivating *Escherichia coli* O157:H7 and *Staphylococcus aureus* on tile

Siriporn Kampan¹, Pichamon Limcharoenchat^{1,*}, Chutamas Maneewong¹
and Piyanuch Niamsup¹

Cross-contamination is a major cause of foodborne disease outbreaks. Cleaning methods are important to improve the food safety. The objective of this research is to evaluate the effect of formic acid and acetic acid for inactivating *Escherichia coli* O157:H7 and *Staphylococcus aureus* on tile. *E. coli* O157:H7 and *S. aureus* was separated transferred to tryptic soy broth, incubated at 37°C for 24 h, centrifuged, and re-suspended with 0.1% peptone water (250 µl). Re-suspended inoculum (250 µl) was dropped on a sterilized tile and dried at room temperature. Distilled water with different volumes (5-25 ml) and different methods (pouring and spraying), formic acid (0.1-5%; 5 ml), and acetic acid (1-5%; 5 ml) were applied to clean the inoculated tiles. Samples were collected by swab test, diluted, and plated to enumerate survivors (37°C, 24 h). Results showed that spraying method showed greater reduction ($P < 0.05$), for *E. coli* O157:H7, but suggested the same results ($P > 0.05$) for *S. aureus*. Acetic acid (3%) and formic acid (0.1%) reduced *E. coli* O157:H7 for > 5 log reduction, and 4% of formic acid also decreased more than 5 log reduction for *S. aureus*. In conclusion, formic acid and acetic acid have the ability to be used as disinfection substances.

Keywords: Acetic Acid, *E. coli* O157:H7, Formic Acid, *S. aureus*, Tile

¹ Division of Biotechnology, Faculty of Science, Maejo University, Chiang Mai, 50290

*Corresponding author email: limcharo.p@gmail.com

**Study on efficiency of *Phellinus gilvus* (Schwein.) pat
from fruiting body with ethanolic and aqueous crude extracts to
inhibit *Staphylococcus epidermidis* and *Escherichia coli***

Orathai Sertsri^{1,*}, Saranya Khoksiamnuai¹ and Khwanyuruan Naksuwankul¹

The objective of this research was to study the efficiency of the fruiting body of *Phellinus gilvus* (Schwein.). *Phellinus* mushrooms in this genus are mostly shelf mushrooms which grow on trees and logs. It can be distributed in Europe, America and Asia. This genus is popular and well known as a medicinal herb in China for over 2,000 years. It can also be found in forests of Thailand. Villagers bring this mushroom to boil and drink with fermented wine to use as a health tonic. The author is interested in studying the antibacterial activity of this mushroom. Crude extract with tree solvents such as 95% ethanol, white whisky (40% alcohol), and boiling water for an hour to inhibit *Staphylococcus epidermidis* TISTR 2162 and *Escherichia coli* TISTR 527 using agar well diffusion method. The result showed crude extract with all solvents inhibited *Staphylococcus epidermidis* with different concentrations; boiling water (71 mg/mL), 95% ethanol (76 mg/mL), and white whisky (82 mg/mL), respectively. Whereas, *Escherichia coli* was inhibited only boiling water extract at the concentration of 150 mg/mL compared to controls, Tetracyclin and Ciprofloxacin for positive control and the negative control is 3%DMSO.

Keywords: Bacteria, Crude Extract, Medicinal Mushroom

¹ Department of Biology, Faculty of Science, Mahasarakham University

* Corresponding author email: 64010257009@msu.ac.th

**Effect of co-culture of *Acetobacter pasteurianus* AJ 605 and
Saccharomyces cerevisiae var. *boulardii* on chemical qualities and
antioxidant activities of kombucha.**

Apithip Suksai¹ and Duangjai Ochaikul^{1,*}

Kombucha is one of the most popular healthy beverages. It is produced from tea infused with sugar, and a symbiotic culture of bacteria and yeast (SCOBY) is used to ferment the sugar into kombucha. Our research aimed to improve the consistency of kombucha's qualities using isolated microorganisms. The optimal ratio of co-culture of the yeast *Saccharomyces cerevisiae* var. *boulardii* (Y) and bacteria *Acetobacter pasteurianus* AJ 605 (B) (Y:B 8:2, 6:4, 5:5, and commercial starter) fermented kombucha tea for 14 days. The results showed that the pH of kombucha decreased, with increases in titratable acidity and alcohol content. The co-culture ratio of 8:2 (v/v) of *S. boulardii* and *A. pasteurianus* AJ 605 had the highest total phenolic and antioxidant activities on 14 days of fermentation, with phenolic compounds and a DPPH value of 517.57 ± 4.31 mg GAE/mL and $96.32 \pm 0.5\%$, respectively. The yeast cells decreased after 14 days, while the acetic acid bacteria increased after 7-10 days and then decreased. The sensory evaluation showed that kombucha fermented with a ratio of 6Y4B for 7 days had a high level of acceptance. So that the symbiotic cultures of *S. boulardii* and *A. pasteurianus* AJ 605 can be used as starters in kombucha fermentation to achieve the desired consistency and qualities of kombucha.

Keywords : Acetic acid bacteria, Antioxidant, Co-culture, Kombucha, Yeast

¹ School of Science, King Mongkut's Institute of Technology Ladkrabang

*Corresponding author e-mail: daungjai.oc@kmitl.ac.th

Antibiotic resistant bacteria in mangrove forests in the eastern Thailand during years 2020-2022

Naiyana Thatwisai¹, Pathimaporn Lunka¹, Papon Ganjanasiripong¹, Pimnapar Neesanant²
and Thanaporn Chuen-Im^{1,*}

This study aimed to investigate antibiotic resistant bacteria in mangrove forests in the eastern region of Thailand during years 2020–2022. This included Laem Chabang mangrove forest in Chonburi Province; PhraChedi Klang-Nam and Tung Prong Thong mangrove forests in Rayong Province; in Laem Klad Subdistrict, Tha Phrik Subdistrict, and Ta Kang Subdistrict natural mangrove forests in Trat Province. Bacteria used in the study were from Division *Firmicutes*: namely Genus *Staphylococcus*, Genus *Lactobacillus*, Genus *Corynebacterium*, Genus *Bacillus*, Genus *Listeria*, Genus *Streptococcus* and Division *Gracilicutes*: namely Family *Pseudomonadaceae*, Family *Enterobacteriaceae*, Family *Pasteurellaceae*. Using disc diffusion method with 12 antibiotics, the highest rate in 2020 (n=20) was resistant to penicillin (65%), followed by neomycin (60%), cefazolin, ampicillin, and streptomycin (55% each), and susceptible to tetracycline for 100%. In 2021 (n=15), the highest rate observed was resistant to neomycin (93%), followed by tobramycin (87%), penicillin (80%), streptomycin (73%), cefoxitin (63%), and chloramphenicol (73%). For year 2022 (n=75), the highest rate was resistant to penicillin (35%) followed by cefazolin (17%), chloramphenicol (17%), ampicillin (15%), cefoxitin (12%), and susceptible to gentamycin and neomycin for 100%. The highest resistant-antibiotic number in years 2020 and 2021 was 10 antibiotics observed in 4 and 2 isolates, respectively whereas the highest antibiotic number observed in 2022 was 5 antibiotic in 3 isolates. It is likely that number of antibiotic resistant bacteria decreased from years 2020 to 2022. However, it is necessary to continue monitoring the situation of antibiotic resistance in bacteria in mangrove forests for confirmation.

Keywords: Antibiotic Resistant Bacteria, Aquatic Environment, Biodiversity, Eastern Region, Mangrove Forest

¹ Department of Microbiology, Faculty of Science, Silpakorn University, SanamChandra Palace Campus, Nakorn Pathom, 73000

² Thai Association for Biotech Industries, 88 Chaloe Phrakiat Rama 9 Road, Nong Bon Subdistrict, Prawet District, Bangkok

* Corresponding author email: chuenim_t@su.ac.th

Study of fermented cassava pulp with *Saccharomyces cerevisiae* to increase the amount of protein in concentrated food for cattle

Tappagorn Leelatam^{1,2,*}, Sunti Phewphong² and Wuttichai Roschat^{2,3}

This research was to study the effect of cassava pulp fermentation time with *Saccharomyces cerevisiae* microorganisms on protein content in concentrate feed for fattening cattle. The study was divided into 2 parts: (1) the analysis of protein content and nutritional properties of cassava pulp fermentation with *S. cerevisiae* microorganisms at 14 days of fermentation and 21 days of fermentation for fattening cattle. The results revealed that the composition of the cassava pulp after a 21-day fermentation process with *S. cerevisiae* included the following elements: 21.28% protein, 77.32% moisture, 9.64% fiber, 0.62% fat, and 5.32% ash were more significant than the 14-days of fermentation. The results were more significant than the 14 days of fermentation with a protein content of 18.40%, moisture content of 62.56%, fiber of 12.36%, fat of 0.44%, and ash of 6.65%, respectively. Part (2) was to study the level of cassava pulp and microorganisms suitable for feed for fattening cattle in the last 3 months of the fattening process. In the study, the samples were separated into 2 groups, with fattening cows in each of the 3 groups of experiments. The results showed that the duration of fermentation of cassava pulp with *S. cerevisiae* affected the marbling score of beef. The sample group used fermented cassava pulp with *S. cerevisiae* affected in the fermented medium at 14 days of the fermentation, showing the beef cattle's marbling score was between grade 4.0 - 5.0. While the samples using cassava pulp mixed with *S. cerevisiae* in the fermented medium at 21 days of fermentation had low marbling scores of beef cattle over 4.0. Therefore, the formula for fermented cassava pulp with *S. cerevisiae* is an alternative to using local resources to develop a quality feed for cattle breeding in agriculture.

Keywords: Beef Cattle Feed, Beef Marbling Score, Cassava Pulp, *Saccharomyces cerevisiae*

¹ Appropriated Technology Center, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000 Thailand

² Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

³ Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

* Corresponding author email: tappagorn111@gmail.com

Effect of spent coffee grounds with rubber wood sawdust substrates on the mycelial growth and primordial formation of *Agrocybe cylindracea* Maire

Waraporn Kaewkhon^{1,*}, Sopida Manopattarakul¹, Thanet Thmmawong¹, Teerapat Chaiyong¹, Thodsaporn kawirachai¹ and Nikhom Naksupan²

The objective of this research was to study the effect of rubber wood sawdust and spent coffee grounds (SCGs) for Yanagi mushroom (*Agrocybe cylindracea* Maire) cultivation. The research was divided into two groups: control group (100% rubber wood sawdust) and the treatment rubber wood sawdust with spent coffee grounds were 0.25%, 0.50 and 1.00%. The results found that the spent coffee grounds at 0.25% and 0.50% respectively showed the fastest growth of Yanagi mushroom mycelium when compared to the control group with the statistically significantly. Whereas the spent coffee grounds at 1.00% showed the slowest mycelium growth. But, the mycelial density was higher than that of the control group. The results of primordial formation of Yanagi mushroom found that the spent coffee grounds at 0.25%, 0.50% and 1.00% were showed the pinhead, primordial and fruiting body with closed cap faster than the control group. Thus, it is indicated that the spent coffee grounds with rubber wood sawdust ability to promote the mycelial growth and primordial formation of Yanagi mushroom.

Keywords : Mycelium Growth, Primordial Formation, Sawdust, Spent Coffee Grounds, Yanagi Mushroom

¹ Biology, Faculty of Education, Chiang Rai Rajabhat University

² Microbiology and Parasitology, School of Medical Science, University of Phayao

*Corresponding author email: waraporn.kae@crru.ac.th

Isolation and characterization of exopolysaccharide produced from bacteria in freshwater fish intestine

Kannika Bunkaew¹, Areeya Thongpradit², Akkanee Pewhom²,
Monthon Lertworapreecha³ and Wankuson Chanasit^{3,*}

This study aimed to isolate exopolysaccharide-producing bacteria from freshwater fish intestines obtained from natural sources for potential use as prebiotics in aquaculture. The ability of the isolated bacteria to produce EPS was investigated through morphological characteristics and staining with 1% crystal violet and was then observed using a microtiter plate (MTP). Four isolates of *Lactobacillus* spp. e.g. B1-1, B2-1, B3-1, and L1 while ten isolates of *Bacillus* spp. e.g. Ba2, B1, B3, B4, F2, P1, P2, P4, P6, and P7 were found to be capable of producing relatively high amounts of EPS which was about OD₅₇₀ higher than 2.0. These bacterial isolates were then cultivated in an EPS-optimum medium containing 30 g/L glucose as a carbon source, beef extract 1 g/L, and ammonium sulfate 0.5 g/L as nitrogen sources. The maximum EPS yield was obtained from *Lactobacillus* sp. B3-1 (86.19%) and *Bacillus* sp. P1 (172.29%). The functional group of the produced EPS from these two isolates was then analyzed by FT-IR. The EPS produced from *Lactobacillus* sp. B3-1 had about 92.25% correlation to dextran, whereas the EPS produced from *Bacillus* sp. P1 showed approximately 90.20% correlation to inulin. Moreover, the EPS produced by *Bacillus* sp. P1 showed an enhancement in probiotic efficiency.

Keywords: *Bacillus* spp, Exopolysaccharide, Freshwater Fish Intestine, *Lactobacillus* spp., Prebiotics

¹ Department of Biotechnology, Faculty of Science, Thaksin University

² Department of Biology, Faculty of Science, Thaksin University

³ Microbial Technology for Agriculture, Food and Environments Research Center, Faculty of Science, Thaksin University

*Corresponding author email: wankuson.c@tsu.ac.th

Diversity of fungi isolated from *Nelumbo nucifera*, Bung Tung Ka-lo, Uttaradit Province

Jirapa Donsrithum¹, Junthana Donmapri¹, Nuchanat Phopphet¹, Kanokwan Pipitthong¹,
Sakunthip Kumkuan¹ and Kodchakorn Lapmak^{2,*}

The objective of this research was to study endophytic and pathogenic fungi associated with lotus. The endophytic fungi were isolated from the lotus samples by tissue transplanting method and pathogenic fungi were isolated by using single spore isolation technique. All fungi were classified based on morphological characteristics and their nucleotide sequences of ITS region. A total of 48 isolates of endophytic fungi were isolated and identified into 14 genera: *Aspergillus*, *Colletotrichum*, *Coprinellus*, *Curvularia*, *Diaporthe*, *Ectophoma*, *Exerohilum*, *Magnaporthe*, *Microsphaeropsis*, *Neofusicoccum*, *Penicillium*, *Pseudofusicoccum*, *Teteaploa* and *Xylaria*. The most common was *Diaporthe* (52.09%). For pathogenic fungi in lotus, a total of 39 isolates were isolated from the lotus leaf and petioles. Nine genera were identified: *Colletotrichum*, *Corynespora*, *Curvularia*, *Diaporthe*, *Flavodon*, *Fusarium*, *Neofusicoccum*, *Penicillium* and *Phyllosticta*. The most common was *Diaporthe* (38.47%). The results of proving pathogenicity in lotus of fungi by Koch's postulate method showed that 15 isolates of fungi were able to cause disease in lotus leaves while 3 isolates of fungi can cause disease in the petioles. Most leaf pathogenic fungi belong to the genera of *Colletotrichum* and *Diaporthe* while the fungi caused disease in petioles belong to the genera of *Diaporthe* and *Fusarium*.

Keywords: Endophytic Fungi, *Diaporthe*, *Nelumbo nucifera*, Pathogenic Fungi

¹Department of Science, Branch of Biology, Faculty of Education, Uttaradit University

²Department of Biology, Faculty of Science and Technology, Uttaradit University

*Corresponding author email: kodchakorn.lap@uru.ac.th

Isolation of high lead-tolerant fungi from the public dumping site and immobilization on biochar for biosorption capacity

Pimprapa Chaijak^{1,*}

The objective of this research was to examine the isolation, identification, and characterization of fungi that can be tolerate to lead (Pb) obtained from soil samples at a public dumping site in Phattalung province, Thailand. The isolated fungi were then immobilized on agricultural waste biochar for the removal of Pb from aqueous solutions. Twenty-one fungal strains were isolated from the soil sample using potato dextrose agar plates after enriching the sample ten times with 100 ppm Pb. The fungal strain DP13 demonstrated the highest Pb adsorption capacity of 71.40 ± 0.62 mg/g at a Pb concentration of 100 ppm and was identified through ITS sequencing as *Odontoefibula orientalis*. The Pb tolerance of the fungus was observed at various Pb concentrations ranging from 10 to 10,000 ppm. Moreover, *O. orientalis* immobilized on rice straw biochar exhibited the maximum Pb removal capacity of $98.37 \pm 0.55\%$ within 24 hours at an initial concentration of 100 ppm. *O. orientalis* has not been previously reported as a potential bioadsorbent for the removal of Pb ions. Thus, its Pb tolerance trait can be utilized in the disposal of Pb from the environment.

Keywords: Bioremediation, Biosorption, , Filamentous Fungi, Heavy Metal, Lead

¹ Faculty of Science, Thaksin University

*Corresponding author email: pimprapa.c@tsu.ac.th

Isolation and Identification of Ammonia and Nitrite removing Bacteria from Nile tilapia pond

Thanyalak Pimsalee¹, Chutamas Maneewong^{1,*}, Nissara Kitcharoen² and Pairote Wongputtisin¹

In the fast-growing aquaculture industry, pollution from nitrogen compounds such as ammonia, nitrite and nitrates are often found. Most nitrogen compounds come from aquatic animals, food waste of protein-rich aquatic animals causing of fish kills. The problems of ammonia and nitrite accumulation fishponds can be solved by the use of microorganisms. The objective of this research is selection of bacteria capable of removing ammonia and nitrites. The bacteria were isolated from fishponds ammonia and nitrite removal were determined by phenate and colorimetric methods, respectively. The results found that 14 isolates were able to degrade the ammonia and nitrite. Then, the 3 isolates including *Bacillus subtilis*, *Priestia aryabhatai* and *Bacillus licheniformis* were identified and selected, the criteria for selection was non-pathogenic. Also, efficiency of ammonia and nitrite removal in 1 L of water from fishpond was evaluated. The results showed that the mixed culture of 3 strains could reduce ammonia by 36.58% of the initial ammonia content. And nitrite was 92.14% of the initial nitrite content.

Keywords: Ammonia, Nile Tilapia Pond, Nitrite, Nitrogen Compounds

¹Program in Biotechnology, Faculty of Science, Maejo University, Chiang Mai, 50290

²Faculty of Fisheries Technology and Aquatic Resources, Maejo University, Chiang Mai, 50290

*Corresponding author email: chutamas_m@yahoo.com, chutamas@mju.ac.th

**Isolation of *Trichoderma* from soil sample of the Arabica coffee plantation
at Doi Pang Khon, Chiang Rai Province**

Waraporn Keawkorn¹, Saowani Khattamat¹, Tanat Pinyo¹, Sasivimon Wongpradit¹,
Nikom Naksupan² and Somboon Kamtaeja^{1,*}

Trichoderma isolations were collected from soil sample in the Arabica coffee plantation area of Doi Pang Khon, Muang District, Chiang Rai Province and studied. *Trichoderma* can be identified using four morphological characteristics based on morphology patterns on PDA media, including colony, mycelium growth, conidiation and pigmentation. It was found that *Trichoderma* grows on PDA in specific patterns depending on the species. In this investigation, nine different *Trichoderma* patterns were isolated.

Keywords: Arabica Coffee, Morphology, Soil Sample, *Trichoderma*

¹ Biological program, Faculty of Education, Chiang Rai Rajabhat University

² Department of Micrology and Parasite, School of Medical Sciences, Payao University

*Corresponding author email: somboon.som@crru.ac.th

Screening of cellulase, pectinase and phytase producing bacteria from honey and stingless bee honey

Sumaiyah Yaprajan¹, Benyapa Prakit¹, Wiyakan Sittiprakan² and Monthon Lertworapreecha^{3,*}

Enzymes are biological catalysts that play an important role in living organisms and can apply in many industries, including livestock farming, to help increase animal productivity. Many probiotic bacteria can produce nutrient-digesting enzymes; therefore, this study aims to screen probiotic bacteria capable of synthesizing cellulase, pectinase, and phytase from 19 isolates of honey and stingless bees tested on carboxymethyl cellulose (CMC) agar, pectin agar, and phytase screening medium (PSM). The results showed that thirteen isolates of stingless bees and honey bee enzymes were isolated: 4 isolates of honey were BPW-301, BPW-702, BPW-G1 and BPW-M, and nine isolates of stingless bees were BPW-SB2, BPW-SB6, BPW-SB8, BPW-SB9, BPW-SB10, BPW-SB12, BPW-SB14, BPW-SB21 and BPW-SB22. Some isolates were tested to produce all three enzymes were BPW-SB2, BPW-301, BPW-SB6, BPW-SB8, BPW-SB9, BPW-702, BPW-SB10, BPW-M, BPW-SB14 BPW-SB22 and BPW-SB21. The study showed that bacteria isolated from honey and stingless bees produce enzymes that may lead to future utilization.

Keywords: Cellulase, Honey, Pectinase, Phytase, Stingless Bee Honey

¹ Biotechnology program, Faculty of Science, Thaksin University, Phatthalung Campus

² Microbiology program, Department of Biology, Faculty of Science, Thaksin University, Phatthalung Campus

³ Microbial Technology for Agriculture Food and Environment Research Center, Faculty of Science, Thaksin University Phatthalung Campus

* Corresponding author email: worapreecha@gmail.com

Screening of gamma aminobutyric acid (GABA) and anti-oxidant producing *Bacillus* isolated from the honey of bees and stingless bees

Benyapa Prakit¹, Patthira Jansiri², Kittiya Khongkool¹, Wankuson Chanasit³
and Monthon Lertworapreecha^{3,*}

GABA is a non-protein amino acid that acts as a neurotransmitter and helps to reduce stress, promote muscle building, and reduce fat accumulation. Some probiotics such as *Bacillus* spp. have been reported as a potential GABA producer and antioxidant activity. In this study, 22 isolates of *Bacillus* spp. isolated from honey and stingless honey samples were investigated the GABA production. The result showed three isolates, namely BPW-SB21, BPW-SB17, BPW-14 were able to produce a maximum amount of GABA of 985.59 ±0.4 ng/mL, 963.65 ±1.3 ng/mL and 962.51 ±1.1 ng/mL, respectively. In addition, antioxidant activity was examined by DPPH assay and the result demonstrated that BPW-SB2, BPW-SB2 1, BPW-SB1 were able to produce a maximum amount of anti-oxidation of 75.44 ±0.5%, 72.30 ±1.6%, 70.80 ±0.2%, respectively. The results suggest that the newly isolates of *Bacillus* from honey and stingless honey samples may be a promising bacterial candidate for use as a potential GABA producer with antioxidant activity.

Keywords: Antioxidant, *Bacillus*, Gamma Amino Butyric Acid, Honey, Stingless Bee Honey

¹Biotechnology program, Faculty of Science, Thaksin University

²Microbiology program, Department of Biology, Faculty of Science, Thaksin University

³Microbial technology for Agriculture Food and Environment Research Center, Faculty of Science, Thaksin University

*Corresponding author email : worapreecha@gmail.com

A survey of *Actinomycetes* in mangrove forests in the upper gulf of Thailand

Panupong Chommee¹, Pichamon Wuttiwong¹, Papon Ganchanasiripong¹,
Thongchai Taechowisan¹ and Thanaporn Chuen-im^{1,*}

The increasing threat of antimicrobial resistance has proven to be detrimental to the treatment of bacterial infections. Relevantly, it is widely acknowledged that *Actinomycetes* act as a source of antibacterial secondary metabolites. The main objectives of this study were to isolate *Actinomycetes* from mangrove soil and to examine their ability to produce secondary metabolites with antibacterial activity. Soil samples were collected from mangrove forests, located around the coasts of the upper Gulf of Thailand, at 5 cm depth in six provinces, namely, Chonburi, Chanthaburi, Samut Prakan, Rayong, Phetchaburi, and Trat. In total, 31 actinomycete strains were isolated on the International *Streptomyces* Project-2 (ISP-2) medium. The results of *Actinomycetes* identification through 16S rRNA gene sequencing showed that the isolates belonged to the genera *Streptomyces* (74%), *Nocardia* (20%), *Micromonospora* (3%), and *Saccharopolyspora* (3%). Moreover, a double-layered overlay bioassay revealed that isolate I15 exhibited the best inhibitory activity against *Staphylococcus aureus* TISTR885, *Staphylococcus epidermidis* TISTR518, and *Pseudomonas fluorescens* TISTR358, with inhibition indices of 7.08, 9.17, and 8.57, respectively. Analysis of the 16S rRNA gene sequencing-based identification, compared to the GenBank sequence database, revealed that isolate I15 is most closely related to *Streptomyces qinglanensis*, recorded as a rare species.

Keywords: *Actinomycetes*, Antibacterial Activity, Biodiversity, Mangrove Forest, *Streptomyces*

¹ Department of Microbiology, Faculty of Science, Silpakorn University, Nakhon Pathom, 73000

* corresponding author email: suy85@hotmail.co.uk

Effect of sodium nitrate reduction on sunscreen formation in cyanobacterium *Lyngbya* sp.

Nittaya Chaiyanate^{1,*} and Narumon Udom²

Lyngbya is an excellent example of cyanobacterial strains, showing diversity in the secondary metabolites. Thus, the aim of this research was to study the effect of decreasing sodium nitrate content in BG-11 medium on the formation of photoprotective compounds, scytonemin and mycosporine-like amino acids (MAAs), in cyanobacterium *Lyngbya* sp., which were isolated from semi-organic paddy soil in Phra Nakhon Si Ayutthaya. Cyanobacterium *Lyngbya* sp. was cultured in BG-11 medium, which had sodium nitrate of 1.5 grams per liter (control) and 0.75 grams per liter (treatment), with 3 replicates. Cultures were grown at 25–28 degrees Celsius in a cool white fluorescent tube, providing a light intensity of 1,500–1,800 lux for 24 hours per day. Cyanobacterium *Lyngbya* sp. cells were harvested on experimental days 10, 15, and 20. Cells were extracted and analyzed for sunscreen substances. Absorption of the curde extracts was measured at wavelengths from 200 to 700 nm using a UV-Vis spectrophotometer. The results showed that the UV-absorption spectrum of cyanobacterium *Lyngbya* sp. curde extracts of MAAs showed a peak of MAAs at 327–348 nm at the 10th day of cell cultivation in both control and treatment; the absorption peak at 310–362 nm is the UV-absorption spectrum of the photoprotective compound MAAs. Whereas UV-absorption of Scytonemin did not appear at the peak of 252, 278, or 300 nm. The absorbance spectra of scytonemin extracts of *Lyngbya* sp. showed other biological substance peaks, e.g., MAAs, chlorophyll, and carotenoids. Decreasing the sodium nitrate contents can stimulate sunscreen formation MAAs but not scytonemin in cyanobacterium *Lyngbya* sp. cells.

Keywords: Mycosporine-like Amino Acids, *Lyngbya*, Photoprotective Compound, Scytonemin

¹ Major of Biotechnology, Office of Educational Affairs, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: nittaya@go.buu.ac.th

The study of waste oil absorption using chitosan mixed with coconut husks sheet

Pitchaya Sriuthaisiriwong^{1,*} and Siriorn Vanapongsakul²

Nowadays, there are a lot of oil spills in the sea. This has an impact on the environment and marine ecosystems. The aims of the study were to the effectiveness of absorbing waste oil using chitosan mixed with coconut husks. Solubility of chitosan in acetic acid solution was 2% acetic acid to dissolve chitosan. Then, coconut husks were prepared by soaking with 1M NaOH for 8 hours. Next, the solution of chitosan was mixed with coconut husks and starch pastes. The mixture was baked at 50 °C for 8 hours to form as an absorption sheet. As a result, the best absorption sheet depends on the higher amount of coconut husks mixed with the solution of chitosan because oil permeability is decreased when mixed with a more concentrated chitosan solution. This absorption sheet can be used to absorb waste oil in the sea and be environmentally friendly.

Keywords: Chitosan, Coconut Husk, Waste Oil

¹ Department of Scius, Faculty of Science, Burapha University, Chonburi, 20131

² Department of Scius, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: botan.pitchaya@gmail.com

Bioremediation of contaminated diesel and bioelectricity generation using a marine bacterial consortium integrated with a microbial fuel cell

Kedsirin Ruttajorn^{1,2}, Panisa Michu³, Junjira Thipraksa¹ and Pimprapa Chaijak^{1,2,*}

Biodegradation is a commonly used method to treat seawater polluted by petroleum. In addition to its ability to selectively degrade pollutants, it is also important to investigate the effectiveness of degradation and the benefits of restoration. This study focused on selecting a group of bacteria that are able to degrade diesel in marine sediment, shaking them at 150 rpm for 48 hours. The bacterial consortium called MB11 was found to be the most effective in removing diesel, with a removal rate of $53.77 \pm 0.59\%$. The consortium MB11 consists mainly of six types of bacteria: *Enterococcus faecalis*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Raoutella planticola*, *Enterobacter soli*, and *Oceanotoga teriensis*. The effective bacterial consortium MB11 was integrated with the floating MFC for electricity generation. Microbial fuel cells are a technology that has received a lot of attention today. due to its ability to treat pollutants and provide by-products as electrical energy. The maximal open circuit voltage (OCV) and power density (PD) of 676.88 ± 5.94 mV and 0.16 ± 0.02 W/m³ respectively.

Keywords: Bioremediation, Diesel Contaminated Seawater, Electricity Generation, Marine Bacteria, Microbial Fuel Cell

¹ Department of Biology, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand

² Microbial Technology for Agriculture, Food and Environment Research Center, Thaksin University, Phatthalung 93210, Thailand

³ Department of Biotechnology, Faculty of Science, Thaksin University, Phatthalung 93210, Thailand

* Corresponding author email: pimprapa.c@tsu.ac.th

Above-ground biomass of the community forest in Chiang Rai province: A case study of Ban Rong Khue community forest

Thanet Yoeso^{1,*} Phatcharaphon Kaewkaen¹ Pensri Malithong² Sutti Malithong²
and Krittawit Suk-ueng¹

Research on aboveground biomass estimation and carbon sequestration of community forests Case study: Ban Rong Khue Community Forest, Pha Ngam Sub-district, Wiang Chai District Chiang Rai The objectives of the study for biomass estimation and carbon sequestration in Ban Rong Khue community forest are: Allometric equations were used to calculate above-ground biomass and estimate the carbon stock of Ban Rong Khue Community Forest, Pha Ngam Sub-district, Wiang Chai District. Chiang Rai The study found that Biomass estimation and carbon sequestration of Ban Rong Khue Community Forest, Pha Ngam Subdistrict, Wiang Chai District Chiang Rai The forest area is a mixed deciduous forest and a deciduous dipterocarp forest. The study area was approximately 638 rai, where 3 plots of 50 × 20 meter in size and 30 sub-plots of 10 × 10 meter were placed. The average tree biomass was 39.8623 ton per rai and the average carbon stock was 39.8623 ton per rai. 18.7301 ton of carbon per rai And the amount of biomass in the forest area of 638 rai was 25,440.50 ton and carbon storage was 11,957.03 ton, which accumulated in the trunk the most, followed by the branches and leaves, accounting for 80.6, 19.39 and 0.01 percent, respectively.

Keywords : Biomass, Carbon storage, Community Forest

¹ Environmental Science and Technology Program. Faculty of Science and Technology, Chiang Rai Rajabhat University, 57100

² Technology and Innovation Transfer Institute, Chiang Rai Rajabhat University, 57100

* Corresponding author email: 621459007@cru.ac.th

Study and design of appropriate sewage methods in KMUTT Bang Khun Thian

Anatta Nunthatraithip¹, Jutharat Sunprasert², Kantasit Kongthip¹, Sukontee Suracharoenchai^{1,*}
and Tas Yusootorn²

The King Mongkut's University of Technology Thonburi (KMUTT), in the education service area of Bang Khun Thian, is located near a mangrove forest. As a result, the soil therefore becomes more salinized than usual, which also disturbs the salinity of the local water sources and causes a higher level of salinity in the wastewater in this area. This project aimed to study and design a suitable wastewater treatment method in KMUTT Bang Khun Thian to reduce water salinity until it is safe to use for watering freshwater plants. One of the desalination methods that utilizes the distillation concept is the solar still. When saltwater is placed in a container with a transparent material cover and exposed to direct sunlight, the water will heat up and vaporize. The steam produced will adhere to the covering material and condense into less saline water. Using PVC pipes to construct the prototypes rectangular, trapezoidal shape. As a result, it was found that it can reduce salinity by up to 86.24 percent. Because of the slow rate of evaporation, there is still an issue currently. A small amount of steam is escaping from the system, and while it sticks to the plastic where it is not needed, preventing some water droplets from falling down the gutter. The quantity of water received is less than expected. The machine will eventually be changed to improve its suitability.

Keywords: Desalination, Evaporation, Salinity, Wastewater

¹ Darunsikkhalai Science School, King Mongkut's University of Technology Thonburi, Bangkok, 10140

² Engineering and Science Classroom, King Mongkut's University of Technology Thonburi, Bangkok, 10140

* Corresponding author email: sukontee.suracharoenchai@mail.kmutt.ac.th

Organic carbon content in seagrasses bed, Koh Kood, Trat Province

Jariyavadee Suriyaphan^{1,*}, Thanasak Thawichai¹, Watcharabhorn Sungkaphan¹

Kedsaraporn Motakul² and Jittra Teeramaethee³

This research was determined total organic carbon in seagrass and sediment around Koh Kood Island. The sample were collected from 7 stations on June 2020. Seagrass biomass was determined above-ground and below-ground biomass, while the sediment was compare between depth, 0-3 and 3-6 centrimeters. There were 4 seagrass species found in this study. *Halodule pinifolia* was the dominant species. The highest biomass was found in *Cymodocea surrulata*, while the highest of total organic carbon was found in *Cymodocea surrulata*. Otherwise, the total organic carbon in sediment was significantly different ($p<0.05$) that relate with the high below-ground of seagrass.

Keywords: Koh Kood, Organic Carbon Content; Seagrass

¹ Major of Aquatic Science, Faculty of Science, Burapha University

² Thai Island and Sea Natural History Museum, Naval Special Warfare Command, Royal Thai Navy

³ Institute of Marine Science, Burapha University

*Corresponding author email: jariyavadee@buu.ac.th

The simulation of circulation and contaminant distribution in seawater in the offshore shellfish culture areas in Sriracha District, Chonburi Province

Pattinee Kongpradit¹ and Anukul Buranapratheprat^{1,*}

This research is conducted to simulate circulation and contaminant distribution based on passive tracer experiments in the offshore shellfish culture areas in October 2021 (inter-monsoon), January 2022 (northeast monsoon), May 2022 (inter-monsoon), and August 2022 (southwest monsoon). The distribution of a conservative tracer as a contaminant from two potential sources, the Sukreep Canal and the south of Sriracha Bay, to the shellfish culture area was investigated. The current moves southward in October and January and northward in May and August following the monsoonal prevailing wind. The tracer from the Sukreep Canal, located in the north, was transported to the culture area by the southward current in October and January. A contaminant source in the south near Sriracha Market moved to the area following the northward current developed in May and August. Water quality data from field measurements confirm this finding related to the influences of external contaminant sources. However, the water quality data also reveal the influence of waste from the cultural area as a source of nutrients released into the water column.

Keywords: Passive Tracer Experiment, Shellfish Culture, Water Circulation, Water Quality

¹Department of Aquatic Science, Faculty of Science, Burapha University

* Corresponding author email: anukul@buu.ac.th

Study of nutrient contents in vermicomposts produced by the African Nightcrawler (*Eudrilus eugeniae*)

Khanittha Thoyalo¹, Sasithon Weiyae¹, Takdanai Kawinja¹, Chisanupong Jitjom¹
and Krittawit Suk-ueng^{1,*}

The study of nutrient contents in Vermicomposts produced by the African Nightcrawler (*Eudrilus eugeniae*) (200 g) was conducted from 10 December 2022 to 9 January 2023. were carried out using cow dung as bedding and fed with these organic wastes (*Ipomoea aquatica*, *Napa cabbage* and *Chinese broccoli*) and cow dung. The results found that nutrient contents (carbon/nitrogen ratio, organic matter, nitrogen, phosphorus and potassium) in each plant were different. Carbon/nitrogen ratio obtained from *Ipomoea aquatica*, *Napa cabbage*, *Chinese broccoli* and cow dung were 18:1, 21:1, 22:1 and 19:1. Organic matter obtained from *Ipomoea aquatica*, *Napa cabbage* and *Chinese broccoli* and cow dung were 57.41%, 68.20%, 69.87% and 61.87%, respectively. Nitrogen obtained from *Ipomoea aquatica*, *Napa cabbage* and *Chinese broccoli* and cow dung were 1.85%, 1.87%, 1.87% and 1.86%, respectively. Phosphorus obtained from *Ipomoea aquatica*, *Napa cabbage*, *Chinese broccoli* and cow dung were 0.32%, 0.28%, 0.30% and 0.28%, respectively. Potassium obtained from *Ipomoea aquatica*, *Napa cabbage* and *Chinese broccoli* and cow dung were 1.43%, 1.08%, 1.18% and 1.16%, respectively. Consequently, nutrient contents were according to the organic fertilizer standards of the department of agriculture except for the carbon/nitrogen ratio from *Napa cabbage* and *Chinese broccoli* that exceeded the organic fertilizer standard set by the Department of Agriculture.

Keywords: Earthworm, Fertilizer, Organic

¹ Environmental Science and Technology Program, Faculty of Science and Technology, Chiang Rai Rajabhat University, Chiang Rai, 57100

* Corresponding author email: nsukung@gmail.com

Analysis of rice growth from physiological monitoring and green excess index using digital photographs

Jutharat Thongbai¹, Donyawat Tahwiang¹, Pimsiri Suwannapat^{1*} and Montri Sanwangsri²

The technology for measuring plant growth normally uses advanced technology. Therefore, this study focuses on monitoring physiological data and analysing functional stay-green of rice using mobile phone photographs. In the experimental study area, 4 plots of Khao Dawk Mali 105 rice were planted. Relationship between actual measured data and photographic scale counting of the rice height show a polynomial relationship $y = -0.0054x^2 + 2.0979x - 47.995$ ($R^2 = 0.8609$). When analysing RGB color code and green excess index (GEI) from the vertical photographs by RStudio, it was found that the GEI increased in the 9th week and remained constant during weeks 12 and 19, before decreasing during the harvest period (week 22). The photographic data revealed that exposure settings captured by Camera FV-5 were important for RGB and GEI analysis. The study found that photographic data could effectively measure rice height, but GEI analysis was necessary to filter out variations in light intensity and shadow using a standard color chart.

Keywords: Digital Image, Green Excess Index, RGB, Rice Height, Rice Canopy

¹ Micrometeorological Research Unit, School of Energy and Environment, University of Phayao, Phayao, 56000

² Agriculture and Forestry Climate Change Research Center, Faculty of Agriculture, Chiang Mai University, Chiang Mai, 50200

*Corresponding Author email: pimsiri.su@up.ac.th

Database of local plants in eastern floristic region in RSPG-Burapha

Pitak Sootanan^{1,*}, Pitchayakorn Thomwong¹, Kriangsak Anekpong¹
and Benchawon Chwapreecha²

RSPG-Burapha (<https://www.rspgburapha.com/>) is a collection of information on biological resources, physical resources and cultural and wisdom resources of the East by Burapha University under the design according to the resource allocation guideline of the Plant Genetic Conservation Project Under the Royal initiative of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG). Database of local plants in Eastern floristic region is one of nine bioresource databases that have been created to systematically store indigenous plant species surveys (<https://plantae.rspgburapha.com/>). Searching for information has been developed suitable for use which was divided into 5 types: 1) Searching by keyword of scientific name or local name, 2) Searching by sample type, 3) Searching by taxonomic rank, 4) Searching by scientific name and 5) Searching by distribution map. There are a total of 75 plant species. These were developed for general public access to local native plant resources and can take advantage of the information to add value to the community, including the use of survey data to further conserve their local resources.

Keywords: Database, Local Plants, Eastern Floristic Region, RSPG-Burapha

¹ Department of Biochemistry, Faculty of Science, Burapha University

² Department of Biology, Faculty of Science, Burapha University

*Corresponding author email: pitak@buu.ac.th

Fish diversity and feeding habits of *Channa gachua* (Hamilton, 1822) in headwater stream in Pak Panang basin of Khao Pu - Khao Ya national park

Thiwapakot Panbow^{1,*}, Tueanta Ramarn¹ and Akkanee Pewhom¹

The headwater stream of Pak Panang Basin is located at Baan Wang Hon, Cha-uat District, Nakhon Si Thammarat Province contains a popular tourism industry and there is a variety of freshwater fauna. Explorations of fishes in the Headwater stream at Baan Wang Hon including 4 stations namely with Wang Hon Canal, Huay Nam Sai Reservoir, Baan Wang Hon and Huay Hin, for 3 months from November 2021 to January 2022 during the rainy season. We were found 11 orders, 17 families, 27 genera and 31 species. Of the 31 species found, 29 species are native to Thailand and two are alien species. 29 native species, *Notopterus notopterus*, *Devario regina*, *Danio kerri*, *Rasbora paviana*, *Cyclocheilichthys apogon*, *Poropuntius deauratus*, *Mystacoleucus marginatus*, *Hampala macrolepidata*, *Barbodes lateristriga*, *B. binotatus*, *Puntigrus partipentozona*, *Pterocryptis berdmorei*, *Silurichthys schneideri*, *Amblyceps foratum*, *Glyptothorax fuscus*, *Clarias batrachus*, *Oxyeleotris marmorata*, *Dermogenys siamensis*, *Xenentodon canciloides*, *Aplocheilus panchax*, *Macrogathus circumcinctus*, *Mastacembelus* sp., *Betta apollon*, *Channa striata*, *C. lucius*, *C. gachua*, *Parambassis siamensis*, *Pristolepis fasciatus*, *Pao leiurus* and two introduced species; *Channa micropeltes* and *Oreochromis niloticus* are documented for the first time. Moreover, Study Feeding Habits of *Channa gachua*. A total of 52 specimens. Total length from 6.3-17.8 cm, body weight 2-52 g. Analysis of the stomach contents gave 46.15% insects and 15.38% freshwater fishes indicating that *C. gachua* was a carnivorous feeder.

Keywords: *Channa gachua*, Fish Diversity, Khao Pu - Khao Ya National Park, Pak Panang Basin, Stomach Content Analysis

¹ Department of Biology, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: thiwapakot.p@gmail.com

Diversity of cave-dweller snail of the genus *Acmella* Blanford, 1869 in Thailand

Kanyapak Moyadee¹ and Pongrat Dumrongrojwattana^{1,*}

The diversity of cave-dweller snails of the genus *Acmella* Blanford, 1869 in Thailand, Four stations from 3 provinces were investigated. A total of 4 stations and 4 species of the genus *Acmella* were found. The cave-dweller snails have a high specificity to the cave or habitat. And the report presented the discovery of 4 additional species of the genus *Acmella*, namely *Acmella* sp. found in the Phra Khayang cave in Ranong province. Currently, there are a total of 5 species of the *Acmella* Blanford, 1869 cave-dweller snails genus found in Thailand.

Keywords: *Acmella*, Cave Dweller Snails, Thailand

¹ Department of Biology, Faculty of Science, Burapha University, Chonburi, 20130

* Corresponding author email: 62030497@go.buu.ac.th, pongrat@buu.ac.th

Pupillid land snails (Pupillidae) diversity of Satun Province, Southern Thailand

Wachirintra Chouwchob^{1,*} Bang-on Changlom^{2,*} and Pongrat Dumrongrojwattana^{1,*}

A survey of diversity of Pupillidae Turton, 1831 in the limestone hills of Satun province, 18 locations. A genus of Pupillidae was found at only one location and consisted of only one species, *Aulacospira nutadhirai* was identified. The snail genus *Gyliotrachela* was found at 18 locations and consisted of 5 species. *Gyliotrachela phoca*, was found at 5 locations. *Gyliotrachela* sp.1, was found at only one location. *Gyliotrachela* sp.2, was found at only one location. *Gyliotrachela* sp.3, was found at only one location. *Gyliotrachela* sp.4, was found at only one location. This result concluded that the increased diversity of Pupillidae in Satun province, from 3 genera and 4 species, which were *Aulacospira nutadhirai*, *Gyliotrachela khaochongensis*, *Gyliotrachela tarutao* and *Hypselostoma satulensis*, to 8 species in total from 3 genera.

Keywords: *Aulacospira*, *Gyliotrachela*, Pupillidae, Pupilloid Snails, Satun Province

¹ Department of Biology, Faculty of Science, Burapha University, Mueang District, Chonburi 20131 Thailand

² Natural History Museum, National Science Museum, Klong Ha District, Pathum Thani 12120 Thailand

*Corresponding author email: 62030217@go.buu.ac.th, bangon.neang@gmail.com, pongrat@buu.ac.th

Diversity of hypselostomaid micronails in the western region of Thailand

Kunya Seedee¹ and Pongrat Dumrongrojwattana^{1,*}

From the surveys of hypselostomatid snails, family Hypselostomatidae Zilch, 1959 the western region of Thailand in 5 provinces: Tak, Kanchanaburi, Ratchaburi, Petchaburi and Prachuap Khiri Khan. A total of 5 genera and 17 species namely *Acinolaemus*, *Anauchen*, *Aulacospira*, *Gyliotrachela* and *Hypselostoma* respectively. A total of 1 species can identified while there are 15 species unidentified and one genus unidentified.

Keywords: Hypselostomatidae, Terrestrial Microsnails, Thailand, Western Region

¹ Department of Biology, Faculty of Science, Burapha University, Mueang District, Chonburi 20131 Thailand

*Corresponding author email: 62030036@go.buu.ac.th, pongrat@buu.ac.th

Species diversity of family Diplommatinidae in satun province

Supaksorn Pradasuk^{1,*} Bangon Changlom^{2,*} and Pongrat Dumrongrojwattana^{1,*}

From the survey and collection of samples of Diplommatinidae snails in the province of Satun, a total of 10 survey points were examined. The *Diplommatina* species were found at all 10 stations, namely Ko Kao Yai, *Diplommatina* sp.1 and *Diplommatina* sp.2, were discovered. In the cave of Thalu-Fah, a total of 3 species were found, namely *Diplommatina hidagai*, *Diplommatina canaliculata*, and *Diplommatina* sp.8. At the Wongsai Tong Waterfall, 2 species were found, *Diplommatina* sp.3 and *Diplommatina* sp.4, while only *Diplommatina* sp.5 was found in the Pho Yoam Cave. At the Taro Tao Island, only *Diplommatina* sp.2 was discovered, while at the Khao Daeng, 3 species were found: *Diplommatina* sp.2, *Diplommatina* sp.4, and *Diplommatina* sp.6. In the Khao Tanan Cave, only *Diplommatina canaliculata* was discovered, and at the Phaya Bungsa Cave, only *Diplommatina canaliculata* was found. The study found that Diplommatinidae snails have a specific habitat and rely on the moist limestone mountain ranges or the decaying leaves that cover each other. This study reports the diversity of Diplommatinidae snails, and 8 other species have yet to be reported in the Satun province area.

Keywords : Diplommatinidae, Microsnail, Satun Province

¹Department of Biology, Faculty of Science, Burapha University, Chonburi, 20130

²Natural History Museum, National Science Museum Thailand, Pathum Thani, 12120

*Corresponding author email: 62030161@go.buu.ac.th, Bangon.neang@gmail.com, pongrat@buu.ac.th

Microanatomy of the kidneys and sexual segment of the kidney of male Banded Krait *Bungarus fasciatus* (Schneider, 1801)

Akkanee Pewhom^{1,*}

The objective of this study is to study the microanatomy of the kidney and sexual segment of the kidney (SSK) of male Banded Krait *Bungarus fasciatus* (Schneider, 1801). The 5 males were collected and euthanized. The kidneys were removed then processed to be prepared for histological technique. The 5 µm sections of kidney tissue were cut and stained with hematoxylin and eosin. The tissue was observed and photographed under a light microscope. The results found that the kidney is surrounded by connective tissue and divide into two layers namely, cortex and medulla. The cortex consists of nephrons and collecting duct. The nephron consists of renal corpuscle, proximal tubule, intermediate segment and distal tubule. Whereas the medulla consists of intermediate segment, collecting duct, ureter and the parts of collecting duct that differentiate to SSK. The epithelial cell of SSK contains numerous secretory granules. Furthermore, the kidneys has a few of renal corpuscles. Results from this study will provide basic knowledge about microanatomy structure of the kidney. In addition, the knowledge can be applied for teaching and research.

Keywords: Banded Krait, Kidney Tissue, Nephron

¹ Department of Biology, Faculty of Science, Thaksin University, Phatthalung Campus, 93210

*Corresponding author e-mail: pewhomakkanee@gmail.com

A comparison of life cycle and nutritional content in black soldier fly larvae reared on different diets

Kesaraporn Janprasert¹, Kanokwan Poondee² and Duangta Julsirikul^{1,*}

Black soldier fly (*Hermetia illucens* L.) is a true fly that the adult stage can live without feeding while the larval stage feed on various organic wastes. The larvae of black soldier fly contain relative high level of protein and lipid content that are considered as a good quality carbon source. Therefore, it usually used as meat protein alternative. The comparative study of life cycle and nutritional content in prepupal stage of black soldier fly reared on cooked rice and bread showed that they have a similar period of life cycle. However, the larvae reared on cooked rice have significantly higher average body size, body weight, protein and lipid content than that of reared on bread ($P < 0.05$). The result from this study demonstrated the influence of the diet on the nutritional content in black soldier fly larvae. This can be used as a guideline for developing a suitable diet for mass rearing of high nutritional value black soldier fly larvae and also help in decomposition of organic wastes.

Keywords: Black Soldier Fly, Nutritional Composition, Prepupal Stage, Organic Waste Decomposition

¹ Department of Biology, Faculty of Science, Burapha University, Chonburi 20131

² Department of Food Science, Faculty of Science, Burapha University, 20131

* Corresponding author e-mail: duangta@go.buu.ac.th

**A novel preparation of an anesthetic derived from jasmine essential oils
Jasminum officinale L. for use in zebrafish *Danio rerio* (Hamilton, 1822)**

Natnicha Ruentho¹, Tripatchara Atiratana¹, Montree Maneepark¹ and Nalena Praphairaksit^{1,*}

Fish anesthesia is crucial in laboratory animal research, particularly in zebrafish (*Danio rerio* (Hamilton, 1822)), which is a commonly used laboratory animal. Fish anesthesia is necessary to alleviate physiological stress, suppress pain, and facilitate various activities during research and industrial fish farming. The most widely used anesthetic in zebrafish is tricaine methanesulfonate (MS-222), a synthetic chemical. However, MS-222 has been associated with negative effects on both fish and humans. As a result, plant extracts have emerged as a potential alternative to synthetic chemical fish anesthesia. Jasmine essential oils were selected for this study because previous research found that they contain linalool, a key active ingredient that can induce anesthesia in fish. To increase water solubility, jasmine essential oil was dissolved into a solution with absolute ethanol. Then, the proper anesthesia induction concentration for zebrafish during surgery was determined. The results showed that the optimum concentration of jasmine essential oil to induce anesthesia in zebrafish for surgery was 0.25 mL/L. Zebrafish could be sedated within 5 minutes and recover within 6 minutes. These findings indicate that jasmine essential oil can serve as an effective alternative anesthetic for zebrafish.

Keywords: Fish Anesthetic; Jasmine Essential Oils; Zebrafish

¹ Department of Biology, Faculty of Science, Srinakharinwirot University, 114 Sukhumvit 23, Bangkok 10110, Thailand

*Corresponding author email: nalena@g.swu.ac.th

Development of larvicide product from bacteria for controlling of insecticide resistant *Aedes aegypti* larvae

Danaporn Saraprug^{1,*}, Nuntaporn Phonsuwan¹, Porntida Petsuwan¹, Jakkrawarn Chompoonsri¹
and Archawin Rojanawiwat¹

Aedes aegypti is a vector of important public health diseases in Thailand, such as Dengue, Zika, and Chikungunya. Controlling vectors is one of the keys to preventing the spread of diseases. However, chemical resistance problems recently occurred in both adult and larval stages. In this study, *Bacillus thuringiensis israelensis* (Bti) and *Lysinibacillus sphaericus* (Ls) in single and mixed-use formulas were tested. The formulation of Bti 3: Ls 1 mixed larvicidal bacteria was found to be suitable for further development. The efficacy test on laboratory strain larvae (n=1,600) showed $LC_{50} = 0.017180 \pm 0.00107$ mg/L, while the test on resistance strain from the field (n=1,600) showed $LC_{50} = 0.018456 \pm 0.001941$ mg/L, which is no statistically differed. Therefore, the resistance to pesticides of larvae did not affect the effectiveness of this formulation. Moreover, Bti 3: Ls 1 formulation showed the highest larval mortality rate of 84% at 35 days in the simulated field evaluation on the persistence of larvicidal bacteria on laboratory strain. The Bti 3: Ls 1 was formed into a tablet product with the potency of 1,075 ITU/mg to be field tested. The product was applied to the container where larvae were found at a proportion of 1 tablet per 200 liters of water. The presence of larvae was checked every 5 days. The average of no larvae observed is 18.68 days, with the longest being 30 days. However, the rate of water usage is expected to be related to the length of time in controlling larvae in the field.

Keywords: Bacterial Larvicide, Insecticide Resistant *Aedes aegypti*, Mosquito Control

¹ National Institute of Health, Department of Medical Sciences, Ministry of Public Health, Nonthaburi, 11000

*Corresponding author email: danaporn.s@dmsc.mail.go.th

Defatting processes affected on physical and functional properties of selected cricket powder in Thailand

Natnirin Boornasakawee^{1,*}, Nowwapan Donrung¹ and Panida Banjongsinsiri¹

Crickets are known as an alternative protein source. In this study, two species of whole cricket that are commonly cultivated in Thailand; *Gryllus bimaculatus* (Thong Dam) and *Acheta domestica* (Thong Lai) were defatted by using five different methods, (1 and 2) boiling in hot water for 10 or 20 minutes, (3 and 4) soaking in 70% ethanol for 1 or 2 times, and (5) compressing through a screw press at room temperature. Their physical properties: color and water activity and functional properties: density, solubility, water holding capacity, and foaming capacity were investigated in comparison with the whole cricket materials and three samples of the commercial cricket powder products. The results showed that the defatting process had a slight difference on color change ($p < 0.05$). The significant differences in solubility, water adsorption capacity, and foaming capacity of all samples were affected by the defatted process ($p < 0.05$) compared with a whole cricket material. The drying process might be exhibited by the water activity of the defatted cricket powder ($p < 0.05$). Based on this study, the screw press process at room temperature resulted in the good functional properties of defatted cricket powder. However, the defatting using ethanol immersion was found to be reduced its functional properties ($p < 0.05$). As for further food applications of defatted cricket powder, their sensory characteristic must be considered to achieve appropriate products.

Keyword: Cricket Powder, Defatting Process, Functional Property, Physical Property

¹ Expert Centre of Innovative Health Food (InnoFood), Thailand Institute of Scientific and Technological Research (TISTR)
35 Mu.3, Khlong Ha, Khlong Luang, Pathum Thani, 12120 Thailand

*Corresponding author email: krittalak@tistr.or.th

Comparative stem anatomy of some aquatic plants in Phayao Province

Sujira Nontitabut¹, Bunnada Sadsee¹, Suphichaya Prangcharoen¹ and Boonchuang Boonsuk^{2,*}

Aquatic plants normally occur in wetlands or various water sources. They can be classified into four types, floating, submerged, emerged, and shoreland plants. This study aims to examine the stem anatomy of some aquatic plants in Phayao province. Four dicots namely, *Enydra fluctuans*, *Ludwigia adscendens*, *Neptunia plena* and *Trapa incisa* and four monocots namely *Eichhornia crassipes*, *Hydrilla verticillata* and *Pistia stratiotes*, were selected in this study. The paraffin method was performed, and samples were cut using a rotary microtome. Samples were stained with 1% Toluidine blue O dissolved in water. Permanent slides were made and investigated under light microscopy and also photographed using OPTIKA digital camera. The study found that all studied plants have circular stems. One-layer epidermis is present, with hypodermis beneath except *Ei. crassipes*, *L. adscendens* and *P. stratiotes*. Cortex consists of parenchyma or a variety of aerenchyma formations such as honeycomb, wheel-shaped and hollow aerenchyma, and schizogenous air canals. Fibers can also be found in *P. stratiotes*. The vascular bundles of all species are collateral bundles that are arranged continuously in a ring shape in dicot plants but separated from each other in stem of monocot plants. This information can be used to explain the anatomical information and adaptations of aquatic plants in Phayao Province's wetlands.

Keywords: Aerenchyma, Hydrophytes, Hypodermis, Paraffin Method

¹ Demonstration School, University of Phayao, Phayao 56000

² Program in Biology, School of Science, University of Phayao, Phayao 56000

* Corresponding author email: boonchuang.bo@up.ac.th

A comparative study on three Thai *Cassia* L. (Fabaceae) species

Kwanchanok Virasiri¹, Natthawut Triyutthachai² and Sakuntala Ninkaew^{2,*}

Three species of *Cassia* L., namely *C. bakeriana* Craib, *C. grandis* L.f., and *C. javanica* L. share common and local names such as the Pink Shower Tree, Kanlapa Phruek, Chaiya Phruek, and Kanla Phruek, which can cause confusion. The aim of this study is to compare these species based on the characters of their morphology, leaf anatomy, and seed morphology. Three species were collected and identified using the Flora of Thailand. A key to the species and descriptions were provided. The leaf epidermal anatomy of these species was prepared by the peeling method and investigated under compound light microscopy (LM). The results indicated that the shape of the epidermal cell is polygonal, irregular or jigsaw-like. These species were found to have both anomocytic and paracytic stomata. During observation, trichomes with a uniseriate structure ranging from 60-150 µm were noticed, and a druse was also presented. The anatomical features are not suitable for identifying the species. However, the shape of epidermal cells on the lower surface can be used to determine the species of *C. javanica*. The seed morphology of three *Cassia* species was examined through the use of stereoscopic microscopy (SM) and scanning electron microscopy (SEM). The result shows the size of the seeds ranges from 5–9 x 6.5–11 mm, and they have a round or elliptical shape. The coloration of the seeds varies from yellow to brown. The seed coat surface can be either smooth or have fracture lines. The morphological and seed characteristics are useful for identifying *Cassia* species, whereas the anatomical features of the leaf epidermis are not of significant taxonomic value.

Keywords: Caesalpinioideae, Leaf Anatomy, Leguminosae, Morphology, Pink Shower Tree

¹ Sireeruckhachati Nature Learning Park, Mahidol University Nakhon Pathom 73170, Thailand

² Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

*Corresponding author email: sakunni@kku.ac.th

Study on leaf epidermal anatomy, life cycle, and phytochemical screenings of Kratai Cham (*Adenosma indianum* (Lour.) Merr.) in salinity areas

Woraporn Laojinda¹ and Piyanut Khanema^{1,*}

Kratai Cham (*Adenosma indianum* (Lour.) Merr.) is a medicinal plant used in traditional medicine, and smells similar to camphor. The glandular trichomes are found on the epidermal layer and have therapeutic properties in inhibiting bacteria and as an anti-inflammatory agent. However, in the preliminary survey, it was found that there was significant distribution of Kratai Cham in saline soils at Khlong Kham and Hua Na Kham Subdistrict, Yang Talat District, Kalasin Province. In addition to providing valid biological information and study of the uses, this research aimed to study the leaf epidermal anatomy, life cycle, and phytochemical screening of Kratai Cham growing in saline soil areas. The results of life cycle studies during 2019 - 2022 found that the plant grew between July to February yearly. It grew in open areas or at the ecotone between forests and open areas. The leaves showed specific characteristics of multicellular-uniseriate trichomes (3-4 cells arranged in a single row) and two types of glandular trichomes: peltate and capitate. Phytochemicals in leaves were more notable than in roots, stems, and fruits, with at least eight groups found, such as flavonoids, phenolics, alkaloids, coumarins, saponins, tannins, terpenoids, and anthraquinones.

Keywords: Glandular Trichome, Growth, Kalasin, Saline Soil

¹ Department of Biology, Faculty of Science, Mahasarakham University, Maha Sarakham, 44150

*Corresponding author, email: piyanoot_kh@hotmail.com

**Effect of medium and organic components on growth and development of
Bulbophyllum cauliflorum Hook.f. *in vitro* seedlings**

Onrut Inmano¹, Phanmai Yousuksawat¹, Thanakorn Wongsat² and Anupan Kongbangkerd^{1,*}

In vitro seedlings of *Bulbophyllum cauliflorum* Hook. f. were cultured on VW and ½VW supplemented with different concentrations of sucrose (15 and 30 g/L), coconut water (CW) (75 and 150 ml/L) and potato extract (PE) (25 and 50 g/L) for 24 weeks. The results found that the highest survival rates 100% as well as the highest shoot number (6.6 shoots per explant) could observe when *in vitro* seedlings of *B. cauliflorum* were cultured on ½VW medium added with 150 ml/L CW and 50 g/L PE whereas the highest leaves (6.9 leaves) and root number (6.0 roots) per explant were observed on VW medium supplemented with 150 ml/L CW and 50 g/L PE.

Keywords: *Bulbophyllum*, Development, Medium Components

¹ Plant Tissue Culture Research Unit, Department of Biology, Faculty of Science, Naresuan University, Phitsanulok 65000

² Program in Biology, Faculty of Science and Technology, Kamphaeng Phet Rajabhat University, Kamphaeng Phet 56000

*Corresponding author email: anupank@nu.ac.th

**The effect of various culture media on the growth and development of
Bulbophyllum dayanum Rchb.f. seedlings in in vitro culture**

Boworn Kunakhonnuruk¹, Nareerat Rattananurak¹, Thanakorn Wongs²
and Anupan Kongbangkerd^{1,*}

Bulbophyllum dayanum Rchb.f. is the epiphytic orchid distributed in Thailand. In order to investigate the suitable culture medium for growth and development of *B. dayanum*, six different culture media were considered including Murashige and Skoog (1962), Knudson C (1946), Vacin and Went (1949) and half-strength of mineral salts. After 16 weeks of culture, Murashige and Skoog (1962) medium was the most effective, providing a survival rate of 100% and promoting greater growth and development compared to other media. Although the number of new shoots and leaves did not difference significantly. However, the highest number of roots (4.0 root per plant) and leaf length (1.6 cm per leaf) were significantly revealed in Murashige and Skoog (1962) medium.

Keywords: *Bulbophyllum*, Culture media, Propagation

¹ Plant Tissue Culture Research Unit, Department of Biology, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Program in Biology, Faculty of Science and Technology, Kamphaeng Phet Rajabhat University, Kamphaeng Phet 62000

* Corresponding author email: anupank@nu.ac.th

The Effect of Media on the Growth of *Rhynchostylis gigantea* In vitro

M. Suwannachat¹, N. Charintip¹, S. Thayawat¹ and T. Thanyaporn^{1,2,*}

Rhynchostylis gigantea is a *Rhynchostylis* orchid. The flowers bloom during April to May. The petals have a white background with purple-red spots that are beautiful and attractive. *Rhynchostylis gigantea* is distributed in northern part of Thailand and is one of the popular orchids. This research aims to examine the effect of media on growth of *Rhynchostylis gigantea* in vitro. VW (Vacin & Went) medium was prepared with varied the concentration of plant growth regulator ;1 and 1.5 mg/L NAA and 1,3 and 5 mg/L BA and KS medium. The result showed that VW medium combined with 1.5 mg/L NAA and 3 mg/L BA had the highest average number of leaves 4.00 ± 0.70 leaves/explant KS mediam had the highest average of height 1.60 ± 0.21 cm.

Key words: *in vitro*, Plant Growth Regulator, *Rhynchostylis gigantea*

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

² School of Science, University of Phayao, Phayao 56000, Thailand

* Corresponding Author E-Mail Address: thanyaporn.bo@up.ac.th

**Effect of light and medium components on growth and development of
Dendrobium draconis Rchb.f. *in vitro* seedlings**

Wittaya Pakum¹ Onrut Inmano² Sirapapha Tirachai² Anupan Kongbangkerd²
Nuengruethai Jucksri³ and Thanakorn Wongsa^{3,*}

Dendrobium draconis Rchb.f., an epiphytic orchid belonging to the family Orchidaceae, is an important ornamental plant and its extracted compound is anticancer. This study aims to investigate the effect of medium components on growth and development of *Dendrobium draconis* Rchb.f. seedlings, *in vitro*. The sterilized seedlings were cultured on Murashige & Skoog (MS, ½ MS and ¼ MS medium supplemented with different concentrations of sucrose at 0, 15 and 30 g.L⁻¹. The cultures were comparatively incubated under low (6.3 μmol·m⁻²·s⁻¹) and high light intensity (27 μmol·m⁻²·s⁻¹) at 12 hours photoperiod for 32 weeks. The results found that the highest shoot number (10.6 shoots) could be induced on MS medium supplemented with 30 g.L⁻¹ sucrose under low light intensity. Whereas the highest leaf (16.1 leaves) and root (3.4 roots) number could be observed on MS medium under high light intensity.

Keywords: *Dendrobium*, Growth and development, Media components

¹ Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok, 10110

² Plant Tissue Culture Research Unit, Department of Biology, Faculty of Science, Naresuan University, Phitsanulok, 65000

³ Program in Biology, Faculty of Science and Technology, Kamphaeng Phet Rajabhat University, Kamphaeng Phet 62000

*Corresponding author email: thanakorn_wo@kpru.ac.th

The effect of soil substrates and seed treatment on *Coffea arabica* L. seed germination

Somruthai Tunma^{1,*} and Wathana Panyamaneesorn²

This research aimed to study the effects of soil substrates and stimulation methods on *Cartimo Arabica* coffee beans to enhance germination efficiency. It was found that the environmental factors affecting coffee bean germination were the type of soil substrates, greenhouse cover film on seedling tray, and chemicals used for soaking seeds. The germination percentage of coffee beans grown in sand mixed with *Trichoderma* was higher than that of sand and sand mixed with peat moss under greenhouse cover film on the seedling tray. For chemicals used for seed soaking before sowing, it was found that seeds soaked in various solutions had higher germination percentage than those soaked in water as follows: $H_2O_2 > CS > NaOCl > NaCl > water$. Arabica coffee beans germinated in sand mixed with *Trichoderma* soil had higher germination rates compared to sand and sand mixed with peat moss. The results showed that environmental conditions affected seed germination, such as greenhouse cover film on seedling tray and soaking the coffee beans with chemicals before germination, ($H_2O_2 > CS > NaOCl > NaCl$). The germination time was around 30 days, which was faster than the germination time of 45-80 days for the controlled coffee beans.

Keywords : *Coffea arabica* L., Germination, Seed Priming, Soil Substrate

¹Chemistry program, Faculty of Education, Chiang Rai Rajabhat University

²Science program, Faculty of Education, Chiang Rai Rajabhat University

*Corresponding author email: somruthai.tun@crru.ac.th

**Effects of plant media leonardite on growth of green cos lettuce seedling
(*Lactuca sativa* L. ver. Longifolia)**

Nannapat Ruthan¹ and Phissanu Kaewtaphan^{2,*}

Leonardite is a byproduct of the Lignite mine. The properties of leonardite include its porosity, water-absorbing ability and high nutrient content. It suitable for use in a planting crops. However, leonardite has a high acidity level, which means it cannot be used immediately. Therefore, this experiment aims to study the use of leonardite mixed with other plant materials to reduce its acidity and increase its ability to be used as a plant material for agriculture. The experiments are as follows: 1) Peat moss (control) 2) Leonardite mixed with peat moss and biochar 3) Leonardite mixed with black husk and biochar 4) Leonardite mixed with coconut coir and biochar 5) Leonardite mixed with vermicompost and biochar. The experiment found that peat moss resulted in the best percentage of germination, germination index, and average germination time. As for the fresh and dry weight of seedlings, and the fresh and dry weight of roots, leonardite mixed with vermicompost and biochar resulted in the highest weight for lettuce seedlings, which were 16.30 g and 0.72 g, and 3.60 g and 0.31 g, respectively. And when analyzed for nutrient elements and chemical properties, it was found that the leonardite mixed with vermicompost and biochar had the highest Total P at 3,658 mg/kg, Total Mn at 163 mg/kg, and Total Mg at 0.16%, respectively.

Keywords: Green Cos Lettuce, Leonardite, Plant material, Seedlings,

¹ Department of Agricultural Development, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

² Department of Crop production technology, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

*Corresponding author email: phissanu.ka@kmitl.ac.th

Assessment of genetic relationships among *Cryptocoryne* species using SCoT markers in the Mekong River region of Loei and Nong Khai Provinces

Watcharinthonse Seesod¹, Plaifhon Chantasit¹, Ratchaneegorn *Mapanao*¹
and Arpakorn Sakulsathaporn^{1,*}

Thailand is endowed with a rich and diverse collection of aquatic plant resources, which have provided numerous benefits for the cultivation and export-oriented industries of aquatic plants. Additionally, these resources play a pivotal role in the breeding and nurturing of juvenile species in water source ecosystems. Notably, the Mekong River contains a high diversity of *Cryptocoryne* species, specifically in the areas of Loei and Nong Khai provinces, where a unique ecosystem of small sand pockets with rocks exists. Therefore, this study utilized the SCoT technique to evaluate the genetic relationships of 26 samples of *Cryptocoryne* plants from three locations, namely Had-Kumpee in Loei Province, Nong Pla Buek, and Phan Khod Saen Krai in Nong Khai Province, as well as 16 commercial varieties. A total of 23 SCoT primers were used, and clear differentiation was observed in the amplified fragments of 262 bands with a size range of 200-800 base pairs. Subsequently, a dendrogram was constructed using the unweighted pair group method with arithmetic mean (UPGMA) in NTSYS-pc version 2.01e. The coefficients of similarity ranged from 0.57 to 0.94, and the population was divided into two groups. These results can be utilized for the development of plans to restore plant species that have been adversely affected by the unnatural fluctuations of the Mekong River.

Keywords : *Cryptocoryne*, Mekong River, SCoT

¹ Faculty of Interdisciplinary Studies, Khon Kaen University, Nong Khai

*Corresponding author email : arpasa@kku.ac.th

Effects of addition of *Trichoderma asperellum* powder in potting soil containing organic fertilizer for growth promotion in tomato seedlings

Anuthep Pasura^{1,*} and Kanticha Nopparit¹

The objective of this study was to examine the rates of using *Trichoderma asperellum* powder added to the potting soil mixed amended with organic fertilizer for growth promotion of tomato seedlings. This *in vitro* experiment was designed to cultivate tomato seedlings with different compositions of *T. asperellum* powder in potting soil. Growth parameters of tomato seedlings were evaluated after 28 days. The results found that growth promotion of tomato seedlings was found in all treatments added *T. asperellum* powder. Treatment 6 with soil : organic fertilizers : *T. asperellum* in the ratio of 90 : 4 : 6 (by weight), after planting for 28 days, the mean number of leaves was 9 leaves, shoot width was 1.19 mm, dry weight of shoot was 0.41×10^{-3} g and dry weight of root was 0.41×10^{-3} g. The averages of stem and root fresh weights in all treatments were not significantly different. Populations of *T. asperellum* in planting materials were evaluated. The results showed that, after adding *T. asperellum*, the populations of *T. asperellum* increased in all treatments. These results suggested that *T. asperellum* powder may serve as alternative choice to use for promoting the growth in tomato seedlings.

Keywords: Growth Promotion, Microbial Powder, Tomato, *Trichoderma asperellum*

¹ Department of Microbiology, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author, email: anuthep@buu.ac.th

Design and development of database of antioxidant-rich natural fruit and vegetable

Aunchalee Sapaudom¹ and Pitak Sootanan^{1,*}

Fruits and vegetables have health benefits that can be consumed either fresh or processed forms because they contain antioxidants that can help to reduce the risk of chronic diseases in human. Consequently, it has attracted the attention of researchers and a large number of relevant research articles have been published and disseminated. This is the reason for this study to collect data on antioxidants in various fruits and vegetables to design and develop a database. It starts with the selection and data collection, conceptual design, logical design, creation of forms for reporting results on online platforms and an initial usage assessment. The entire database can be designed with 13 entities (tables) and 43 attributes (columns), containing information on 47 fruits and vegetables, 148 antioxidants, 12 antioxidant testing methods. The result of this database increased convenience, saved time, and has a display that meets the needs of users more to find information about the antioxidants found in each fruit and vegetable, including testing methods compared to searching in review articles or existing databases. Therefore, the researcher sincerely hopes that this database will be a starting point for further development in order to be a useful resource to benefit those who are interested in the future.

Keywords: Antioxidant, Database, Fruits, Vegetable

¹ Department of Biochemistry, Faculty of Science, Burapha University

* Corresponding author, email: pitak@buu.ac.th

Exploring the indigenous *Trichoderma* sp. and its biocontrol potential against phytopathogenic fungi

Wankuson Chanasit^{1,2}, Monthon Lertworapreecha^{1,2}, Nugul Intrasungkha¹, Panadda Promjun¹,
Chaisit Niyasom¹ and Pumin Nutaratat^{1,2,*}

Indigenous *Trichoderma* sp. is a group of beneficial fungi that have been found to exhibit significant biocontrol potential against various phytopathogenic fungi. In this study, we explore the potential of indigenous *Trichoderma* sp. as a biocontrol agent against phytopathogens and their role in promoting plant growth. Twenty-one indigenous fungi were isolated from the total of eight collected soil samples from organic agricultural fields in Tha Chamuang subdistrict, Rattaphum district, Songkhla province. Based on ITS region sequence analysis, only four out of the total isolates were identified as *Trichoderma*. Our findings suggested that the indigenous *Trichoderma* sp. TSUxPT3.5 effectively inhibit the growth of various phytopathogens, including *Colletotrichum gloeosporioides*, *Fusarium oxysporum*, *Rhizoctonia solani*, *Sclerotium rolfsii*, *Fusarium moniliforme*, and *Pyricularia grisea*. The mechanism of antagonistic *Trichoderma* sp. TSUxPT3.5 was nutrient and space competition, and the production of fungal cell wall degrading enzyme such as carboxymethyl cellulase (CMCase) and chitinase, in addition, volatile organic compounds (VOCs) was detected and a major component was 2-ethylhexan-1-ol. Notably, this strain was able to support plant growth through indole-3-acetic acid (IAA) production by stimulating the growth of plant roots and enhancing nutrient uptake resulting in an increase of plant growth and yield.

Keywords: Biocontrol, Competition, Phytopathogenic Fungi, *Trichoderma*, Volatile Organic Compounds

¹ Department of Biology, Faculty of Science, Thaksin University, Pa Phayom, Phatthalung 93210, Thailand

² Microbial Technology for Agriculture, Food and Environments Research Center, Faculty of Science, Thaksin University, Pa Phayom, Phatthalung 93210, Thailand

*Corresponding author, e-mail: p.nutaratat@gmail.com

Asparagus preservation method for small-scale farmers

Chitta Sarpetch¹, Mayura Lanchai¹, Pimpisut Suetrong¹ and Sopida Sriwilaiwan^{1,*}

Asparagus (*Asparagus officinalis* L.) is one of the consumer's famous edible plants, a valuable vegetable. Thailand farmers can grow asparagus all year round, and most products are sold to middlemen, who set the prices. Asparagus were stored in a refrigerator in combination with 1%KMnO₄, Ozone (O₃), or hot water (50°C) treatment and then packed in modified atmosphere packaging (MAP) bags before storing at 13°C. Asparagus quality is determined by weight loss, O₂ and CO₂ in packaging, color change (L*, a*, b*), and rot score. Results showed that treated asparagus with 1%KMnO₄, O₃, or hot water and stored at 13°C had a shelf life of 18 days compared to the 12 days of the untreated one. These three preservation methods are alternatives for small-scale farmers to extend shelf life of asparagus household equipment for direct sale.

Keywords: Asparagus, Preservation, Small-scale Farmers

¹ Expert Centre of Innovative Agriculture, Thailand Institute of Scientific and Technological Research, Pathum Thani, 12120

* Corresponding author email: sopida@tistr.or.th

The effect of retail packaging on quality and shelf life of Chinese pork sausage product

Wisanee Nuamekin^{1,*} and Pornteera Rattanarat¹

The aim of this study was to investigate the shelf life of Chinese pork sausage products stored in three different types of packaging: 1) PET/Nylon/LLDPE plastic bags with added oxygen absorber and heat sealing (Control); 2) PET/Nylon/LLDPE plastic bags with vacuum packaging (NY); and 3) K- Nylon/LLDPE plastic bags with vacuum packaging (KNY). The Chinese pork sausages were stored at a temperature of 30 ± 2 °C and a relative humidity of $70\pm 5\%$. The results showed that Chinese pork sausages stored in the KNY bag had a longer shelf life of up to 63 days without bacterial growth compared to those in the Control bag and NY bag with shelf life of only 21 and 42 days, respectively ($p\geq 0.05$). In addition, Chinese pork sausages in the treatment C received higher consumer acceptance scores than those in other packaging types ($p<0.05$).

Keywords: Chinese Pork Sausage, Retail Packaging, Shelf Life

¹ Thailand Institute of Scientific and Technological Research, Thai Packaging Centre, 196 Phahon Yothin Road, Ladyao, Chatuchak, Bangkok 10900 Tel: 02 579 1121 (3205)

* Corresponding author, email: Wisanee@tistr.or.th

Effect of xanthan gum on the qualities of brown rice cookies addition with pineapple Pomace

Orathai Bunthawong^{1,*}, Pratsanee Kongwong¹ and Thanchanok Kiatkamjai¹

The objective of this research was to study the appropriate recipe and the effect of xanthan gum application on the quality of brown rice cookies mixed with pineapple pomace. The appropriate recipe is brown rice flour 28.28 %, pineapple pomace 7.07 %, baking soda 0.44 %, baking powder 0.44 %, icing sugar 15.90 %, salt 0.13 %, eggs 15.90 %, butter 26.51 %, evaporated milk 3.55 % and milk powder 1.78%. Then the brown rice cookies were added xanthan gum at the levels of 0, 1, 1.5, and 2 % compared to the product prepared from wheat flour, it was found that using 1% xanthan gum was the suitable formulation. Product addition with xanthan gum increases the moisture content, water activity, and hardness of the products ($p \leq 0.05$). In terms of sensory quality using the 9-Points hedonic scale preference test method, it was found that cookies prepared from control (xanthan gum 0 %) show the lowest firmness liking score ($p \leq 0.05$). Other characteristics such as appearance, color, odor, taste, texture, firmness, and overall quality liking were not significantly different ($p > 0.05$).

Keywords: Brown Rice Flour, Gluten-free Cookies, Pineapple, Pomace, Xanthan Gum

¹ Faculty of Science and Agricultural Technology, Rajamangala University of Technology Lanna Lampang, 52000

* Corresponding author email: orathai.bun@gmail.com

The study of quality of set-type yogurt during storage

Pornteera Rattanarat^{1,*} and Wisanee Nuamekin¹

The objectives of this study were to evaluate the quality changes and shelf-life of set-type yogurt using a sweetener from stevia, packed in glass jars with vacuum seal (lug cap) and stored at 4°C for three weeks. The study investigated the physical, chemical, microbiological, and sensory changes of yogurt during storage. The results indicated the color values of yogurt (L^* , a^* , b^*) remained stable throughout the storage period. The viscosity of the yogurt decreased until day 14 and then increased until day 21. The titratable acidity significantly increased ($p<0.05$) with increasing storage time, from 0.84% to 0.94%. Meanwhile, the pH value decreased significantly with increasing storage time from 4.34 to 4.20 ($p<0.05$). The study also found that the amount of lactic acid bacteria in yogurt remained above 10^7 CFU/g throughout the 21-day storage period. However, the sensory evaluation showed that consumers did not accept the product after 21 days of storage. Therefore, the shelf life of the yogurt was estimated to be approximately 17 days based on the changes in the quality of the yogurt during storage.

Keywords: Quality, Shel-life, Storage, Yogurt

¹ Thailand Institute of Scientific and Technological Research, Thai Packaging Centre, 196 Phahon Yothin Road, Ladyao, Chatuchak, Bangkok 10900 Tel: 02-579-1121 (3205)

* Corresponding author, email: pornteera@tistr.or.th

Study on the efficiencies of gelling agents in the production of coffee gummy

Supanee Saewa¹, Siriluk Chonlateesaiwiman¹ and Patcharawarin Ruanto^{1,*}

The purpose of this study is to investigate the efficiency of different types and formulas of gelling agents including gelatin, carrageenan, alginate, and mixed carrageenan gelatin to product coffee gummy. The formula that received the best satisfaction score was gelatin 9.5 grams for 80 milliliters of coffee extract, resulting in the pH of 4.20-4.80 and L * a* b * values of 28.58, 17.24, 13.24, respectively. The second-best satisfaction formula was mixed carrageenan-gelatin in the ratio 6:0.27g for 80ml coffee. The results showed that gelatin coffee gummy had the most flexible texture, with a shrinkage rate of 46%, while carrageenan formula was the most inflexible (14.29%). Carrageenan gummy had the fastest setting time. The mixed carrageenan-gelatin gummy required longer time. The gelatin gummy needed the longest setting time, while alginate ones could not solidify. It was found that carrageenan gummy had the highest weight loss. The gummy coffee that had the least weight loss was derived by gelatin.

Keywords: Alginate, Carrageenan, Coffee, Gelatin, Gelling agent, Gummy

¹ Biology program, Faculty of Education, Chiang Rai Rajabhat University

*Corresponding author email: p.ruanto@gmail.com

Study on the efficacy of kitchen mint (*Mentha × cordifolia* Opiz ex Fresen) and lemongrass (*Cymbopogon nardus* (L.) Rendle) leaf extracts against mealybugs

Charuporn Aupachin^{1,*} and Songklod Sarapusit^{1,2}

Mealybugs outbreaks is a major agricultural issue in Thailand. This study aims to determine the pesticidal activity of natural herbal extracts to be used for mealybugs control. In this study, pinkish mealybugs (*Phenacoccus manihoti*) were maintained by two different feeding methods, raising in (i) fresh tomatoes plants and (ii) pumpkins. The results indicated that *P. manihoti* preferred pumpkins as their food source. The number of *P. manihoti* increased much faster on pumpkins. The insecticides (Omethoate) were then tested against *P. manihoti* at 0, 0.01, and 0.02% v/v. The results showed that 0.02% v/v Omethoate exhibited the best insecticidal effect in eliminating *P. manihoti* within 48 hours (80.00% mortality). Next, two local herbs, kitchen mint (*Mentha × cordifolia* Opiz ex Fresen) and lemongrass (*Cymbopogon nardus* (L.) Rendle) ethanolic crude extracts were tested to determine their insecticidal and insect repellents properties. Upon spraying each extract on pumpkin containing *P. manihoti*, the results indicated that both kitchen mint extract (1.5% w/v) and lemongrass extracts (10% w/v) could kill *P. manihoti* with highest mortality rate at 48 hours with 86.67% and 93.33%, respectively. In addition, at 24 hours both kitchen mint (1.5% w/v) and lemongrass extracts (1% w/v) repelled mealybugs with the highest rate at 90 and 80%, respectively. Thus, both kitchen mint and lemongrass extracts exhibited both insecticidal and insect repellent activities against *P. manihoti* that could be useful and environmentally friendly.

Keywords: *Cymbopogon nardus* (L.) Rendle, Mealybugs, *Mentha × cordifolia* Opiz ex Fresen, Insect Repellent, Insecticidal,

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Center of Excellence for Innovation in Chemistry and Research Unit of Natural Bioactive compounds for Healthcare Product Development, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: 62030141@go.buu.ac.th

Study on the biological activity of extracts from *Ocimum tenuiflorum* and *Coccinia grandis* (L.) Voigt as natural insecticides against mealybugs

Kitiporn Sriwoy^{1,*} and Songklod Sarapusit ^{1,2}

This study aims to investigate the effect of natural herbal extracts on mealybugs, one important crop pest in Thailand. In this study, mealybugs were raised in 2 different plants, tomatoes tree or pumpkins. The results showed that raising the mealybugs on pumpkin was the most effective method. The mealybugs were treated with omethoate pesticide to determine the effectiveness of currently used pesticide by spraying method. The results showed that the omethoate insecticide at 0.02% v/v showed the highest mortality rate at 48±11.55%. Next, two medicinal plant extracts were tested for the ability to eliminate and repel the mealybugs (Pseudococcidae). *Ocimum tenuiflorum* extract at high concentrations (1, 2%(w/v)) resulted in 100% mortality after 48 hours. A similar result was obtained for *Coccinia grandis* (L.) Voigt extract at high concentrations (4, 8%(w/v)) resulted in 100% mortality after 48 hours. In addition, at 24 hours 2%(w/v) of *Ocimum tenuiflorum* and 8%(w/v) *Coccinia grandis* (L.) Voigt extracts could repel mealybugs at 66.67±11.55% and 80%, respectively. The results of this study demonstrated the potential use of *Ocimum tenuiflorum* and *Coccinia grandis* (L.) Voigt extracts in mealybugs control management.

Keywords: *Coccinia grandis* (L.) Voigt, Mealybugs, Insect repellent, Insecticidal, *Ocimum tenuiflorum*

¹ Department of Biochemistry, Faculty of Science, Burapha University, Chonburi, 20131

² Center of Excellence for Innovation in Chemistry and Research Unit of Natural Bioactive compounds for Healthcare Product Development, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: 62030139@go.buu.ac.th

Poster Presentation

กลุ่มที่ 2 สาขาวิชาเคมี เคมีประยุกต์
และเคมีอุตสาหกรรม

Synthesis of CuO by cyclic microwave and application as photocatalyst

Pongsapak Fonmanee¹, Thanyarat Sriwanna¹ and Suttasinee Katunyoo^{1,2,*}

Copper Oxide (CuO) is a semiconductor with a high coefficient of light absorption. It is stable at high temperatures and cheap. In this article, CuO was synthesized by the cyclic microwave radiation method which takes a shorter time to synthesize but a high energy consumes. The effects of processing cycles (0-75 cycles) and microwave heating power at 300 W to synthesize CuO from $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$. The purity, structure, crystallinity, particle size, morphology, and photocatalyst property of CuO were studied. CuO that synthesized had a high crystalline and no impurity. CuO used at 45 and 75 cycles has a complex structure and nanosheet that can be formed by themselves. The using of CuO as a photocatalyst was determined by measuring the light absorption of Rhodamine B dye at wavelength 400-700 nm, found that CuO synthesized at 75 cycles has higher absorption in Rhodamine B than at 30 and 45 cycles.

Keywords: Copper oxide, Microwave assisted synthesis, Photocatalyst

¹ Demonstration School University of Phayao, University of Phayao, Phayao, 56000

² School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: Suttasinee.ka@up.ac.th

Green synthesis of 3,4-dihydropyrimidinone derivatives and biological activity studies

Punika Intapan¹, Rawicha Lerdmeenai¹, Siranyathorn Pongnuth¹
and Sorachai Khamsan^{2,*}

This research describes the synthesis of 3,4-dihydropyrimidinone and derivatives using aluminium oxide as a catalyst *via* one-pot three component Biginelli reaction of aromatic aldehydes, ethyl acetoacetate, and urea under solvent-free conditions. This developed method is an efficient, simple work up, short reaction times and environmentally friendly protocol with high yields (48-98%). Preliminary antimicrobial activities were also evaluated using the agar diffusion method. The synthesized products showed a good potential on antimicrobial activity against both gram-positive and gram-negative bacteria.

Keywords: 3,4-Dihydropyrimidinone, Aluminium oxide, Antibacterial activity, Biginelli reaction, Green chemistry,

¹ Demonstration school, University of Phayao, Phayao, 56000, Thailand

² School of Chemistry, University of Phayao, Phayao, 56000, Thailand

* Corresponding author email: sorachai.kh@up.ac.th

**α -Glucosidase inhibitory activity of alkaloid extract from leaf of
Mitragyna speciosa (Korth.) Havil.**

Paradon Kaewsuwan^{1,*}, Asadhawut Hiranrat², Netnapa Chana² and Panita Kongsune³

Diabetes mellitus (DM) is one of the most significant public health concerns worldwide. The α -glucosidase inhibitors are described as the most effective in anti α -glucosidase drugs used in the management of diabetes mellitus. The α -glucosidase inhibitors are beneficial to treatment of DM patients, but several side effects. Alkaloids are promising modulators of this enzyme's activity. In this present work, the alkaloids from *Mitragyna speciosa* (Korth.) Havil, were extracted for α -glucosidase inhibitory activity. As a result, the alkaloid and methanol crude extract had an inhibitory activity higher than that of the methanol crude extract with an the IC_{50} values of 52.9143 μ g/mL and 66.7223 μ g/mL, respectively. An IC_{50} value of alkaloid crude extract was lower than the one found for the most widely prescribed α -glucosidase inhibitor, acarbose (61.6221 μ g/mL). This finding provided that the alkaloids extract has the potential to be as alternatives for therapeutic agent for further anti- α -glucosidase drug development in treatment of diabetes mellitus.

Keywords: α -glucosidase, Acarbose, Alkaloids, Diabetes mellitus, *Mitragyna speciosa*

¹ Master's degree student in Chemistry, Faculty of Science Thaksin University, Phatthalung 93210

*corresponding author, e-mail: 604255020@parichat.skru.ac.th

² Asst. Prof. Dr in Chemistry, Faculty of Science Thaksin University, Phatthalung 93210

² Asst. Prof. Dr in Chemistry, Faculty of Science Thaksin University, Phatthalung 93210

³ Assoc. Prof. Dr in Chemistry, Faculty of Science Thaksin University, Phatthalung 93210

Development of AgMnO_x/C and MnO_x/C as cathode catalysts for glucose alkaline fuel cell

Supansa Dampat¹ and Chakrapong Chaiburi^{1,*}

This study investigated the development of glucose fuel cell catalysts for the fuel cathode and anode of AgMnO_x/C, MnO_x/C, Pd/C, and Pd-CeO_x/C catalysts. The study was divided into two parts: The first studies the morphology of the catalyst and catalyst element composition by SEM and EDS. It was found that the prepared catalyst was very small and lumpy, which has small particles densely distributed on the carbon surface. Second, the catalytic oxidation reaction's electrocatalytic properties are measured by the cyclic voltammetry technique (CV) using glucose as fuel. The glucose concentration ratio was 0.1 to 0.5 M per 0.1 M alkaline KOH solution at a scan rate of 0.01 V/s. AgMnO_x/C and MnO_x/C catalysts are cathode side catalysts and, therefore, resistant to oxidation reactions, and the reduction reaction decreases with increasing concentration of the glucose solution because of interference of non-conductive hydrocarbons. For the Pd/C, and Pd-CeO_x/C catalysts, It was found that the performance concentration of 0.1 M glucose solution showed excellent catalytic. Then, the highest current density of the oxidation peak for the Pd/C was 0.6 mA/cm² at -0.09 V. Meanwhile, the highest current density of the oxidation peak for the Pd-CeO_x/C was 0.2 mA/cm² at -0.09 V, and the stability analysis of Pd/C and Pd-CeO_x/C catalysts were 0.3 and 0.25 mA/cm², respectively.

Keywords: Alkaline fuel cell, Anode, Catalyst, Cathode, Glucose

¹ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: chakrapong@tsu.ac.th

Development of AgVOx/C, AgMnOx/C as cathode and PdCeOx/C as anode catalysts for sorbitol alkaline fuel cell

Pintira Chayboonchoo¹ and Chakkrapong Chaiburi^{1,*}

This study investigated the development of sorbitol fuel cell catalysts for cathode and anode fuels by synthesis of AgVOx/C, AgMnOx/C, and PdCeOx/C catalysts for the cathode and anode. The study was divided into two parts. The first part involved the physical characterization of the catalyst in which all the catalysts were analyzed for their physical characteristics by SEM and EDS. It was found that the prepared catalyst was very small, lumpy, and densely clustered together on the carbon surface with small particles. The second part of the study investigated the electrochemical characteristics of the oxidation of alkaline fuels using sorbitol as fuel. Sorbitol concentration ratios of 0.1 to 0.5M per 0.1M alkaline KOH solution were assessed by the cyclic voltammetry technique at a scan rate of 0.01 V/s. It was found that the PdCeOx/C catalyst are anode side catalysts at the concentration of 0.1 M sorbitol solution. They resulted in oxidation sites with the highest potential difference at the potential range of -0.5 to 0.5 V, which gave the maximum current density of 0.2 mA/cm². To test the AgVOx/C and AgMnOx/C catalysts are cathode side catalysts in the reduction reaction, at the concentration ratios of 0.1 to 0.5 M of sorbitol solution per 0.1 M alkaline KOH solution, when increased with sorbitol concentration, reduced the reduction reaction of the catalyst. There was no oxidation reaction which the hydrocarbon adsorption might cause.

Keywords: Alkaline fuel cell, Anode, Catalyst, Cathode, Sorbitol, Cathode

¹ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: chakkrapong@tsu.ac.th

**Synthesis of reversible thermochromism of polydiacetylene/zinc(II) ion/
zinc oxide nanocomposites in mixed water/propanol:
effect of solvent ratios**

Wannasa Somchai¹ and Ruttayapon Potai^{1,*}

This study introduces the preparation of polydiacetylene/zinc(II) ion/zinc oxide (PDA/Zn²⁺/ZnO) nanocomposites via the solution-mixing method of water and propanol. The addition of 10 %v/v propanol provides the highest percent conversion of PDA/Zn²⁺/ZnO nanocomposite. This phenomenon is denoted by an increase of the absorbance at the maximum wavelength 640 nm. The growth of this absorption peak indicates the blue-phase characteristic of PDA. The addition of propanol reduces the polarity of the solvent. Thus, this process improves the chain organization of diacetylene molecules within the nanocomposites. The colorimetric response of PDA/Zn²⁺/ZnO nanocomposites upon exposure to temperature exhibits the color changes from blue to red. The transition temperature trends to increase upon higher propanol ratios. The reversible thermochromism is still observed. Our study presents a simple method for preparing reversible thermochromic PDA/Zn²⁺/ZnO nanocomposite with relatively high contents. This is important for potential development using in the industrial preparation and the application of PDA materials in various sensors.

Keywords: Co-Solvents, Nanocomposite, Polydiacetylene, Reversible thermochromism, Zinc oxide,

¹Division of Chemistry, Faculty of Science, Nakhon Phanom University, Nakhon Phanom 48000, Thailand

*Corresponding author, email: ruttayaponpotai@npu.ac.th

Synthesis of trityl dithiocarbamate epoxy-andrographolide analogues

Pansachon Intamalee¹, Patcharee Arsakhant¹ and Rungnapha Saeeng^{1,2,*}

Andrographis paniculata Nees, is a medicinal plant that is widely used in some countries in Asia and Thailand for treatment of fever, sore, throats and COVID-19. Andrographolide, an important substance possesses diverse biological activities such as antibacterial property, anti-cancer, and immune stimulation. In this work, we synthesized the epoxy dithiocarbamate andrographolide derivatives for anti-cancer activity studies. The new andrographolide analogues were prepared by chemical reactions *via* tritylation reaction of hydroxy group at C-19 using triphenylmethyl chloride and pyridine, following with epoxidation reaction at C-8(17) alkene with mCPBA, and addition-elimination reaction at C-12 position of natural andrographolide with various dithiocarbamates in the presence of methanol. Finally, the last step was carried out without the use of a catalyst under mild reaction conditions to give new analogues in excellent yield.

Keywords: Andrographolide, Dithiocarbamate, Epoxidation

¹ Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University, Saensook, Chonburi 20131, Thailand.

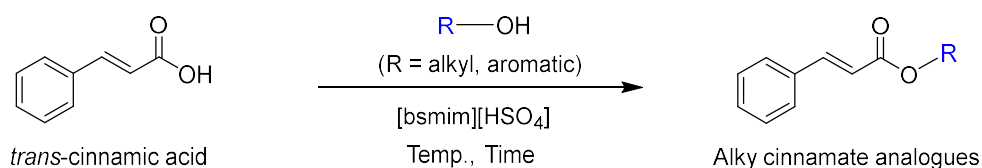
² The Research Unit in Synthetic Compounds and Synthetic Analogues from Natural Product for Drug Discovery.

* Corresponding author. Tel.: +66-081-656-7524., E-mail address: rungnaph@go.buu.ac.th

Synthesis of alkyl cinnamate analogues via esterification using acidic ionic liquid as a catalyst

Prapakorn Sombunmak¹, Warapong senapak², and Ekaruth Srisook^{3,*}

Bioactive natural products can be synthesized by chemical reactions to obtain larger quantities including to modify their structure for better biological activities. We were interested 4-methoxycinnamyl *p*-coumarate (MCC), a natural product derived from the rhizome of the *Etilingera pavieana* (Pierre ex Gagnep) R.M. Sm., which has anti-inflammatory, antioxidant and anti-tyrosinase activities, therefore we studied the synthesis of alkyl cinnamate derivatives via esterification reaction using acidic ionic liquid as a catalyst. The optimum conditions for the synthesis of ethyl cinnamate via esterification from *trans*-cinnamic acid and ethanol, with acidic ionic liquid [bsmim][HSO₄] as catalyst was determined and the reaction condition at 16 or 24 hours, 60 °C and 20 mol% catalyst gave the highest yield. Applying the optimum conditions, four alkyl cinnamate derivatives were synthesized by varying alcohol to *n*-butanol, isobutanol, isopropanol and cinnamyl alcohol in the range of 94-11%.



Keywords: Acidic ionic liquid, Alkyl cinnamate, Esterification reaction

^{1,3} Department of Chemistry, Faculty of Science, Burapha University, Chonburi, 20131

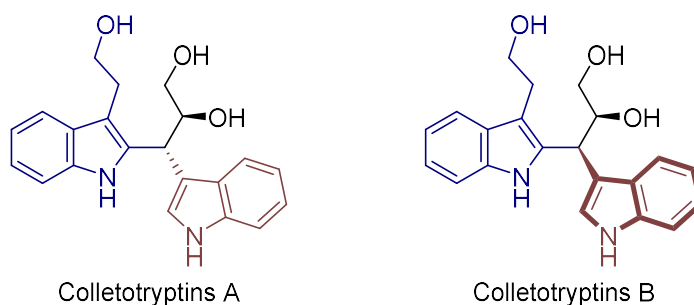
² Science Classrooms in University - Affiliated School Project (SCIUS), Faculty of science, Burapha University, Chonburi, 20131

* Corresponding author email: ekaruth@go.buu.ac.th

Short total synthesis of colletotryptins A and B

Wilailak Saetae¹ and Jaray Jaratjaroonphong^{1,*}

Colletotryptins A and B are natural unsymmetrical 2,3'-bis(indolyl)methane (2,3'-BIM) alkaloid families that exhibit a wide range of biological activities. A pair of diastereomers, colletotryptins A and B, were extracted from purple-brown marine sponges *Petrosia sp.* and by fermentation of endophytic fungus *Colletotrichum sp.* SC1355 which was isolated from leaves of *Cleistocalyx operculatus*. To the best of our knowledge, there has been no report of any synthesis of colletotryptins A and B. In this research, we wish to develop the first and short total synthesis of colletotryptins A and B *via* transindolylation of 3,3'-BIM derivatives under acid conditions. Initially, 3,3-bis(1*H*-indol-3-yl)propane-1,2-diol was first synthesized in high yield by condensation of two equivalents of indole and one equivalent of *D*-glyceraldehyde in the presence of Bi(OTf)₃ as a catalyst in methanol at room temperature for 24 h. Subsequently, 3,3-bis(1*H*-indol-3-yl)propane-1,2-diol was treated with 3-(2-hydroxyethyl)indole employing Bi(OTf)₃ as a catalyst in the mixture of toluene and acetonitrile at room temperature to afford the desired products, colletotryptins A and B in good yield *via* transindolylation reaction.



Keywords: Colletotryptins A and B, Transindolylation, Unsymmetrical 2,3'- bis(indolyl)methane alkaloid

¹ Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University, Chon Buri, 20131

* Corresponding author email: jaray@buu.ac.th

Photocatalytic reduction of CO₂ to methanol by Cu/ZnO-CeO₂ nanoplate catalyst

Akkradach Chotnitisuwan¹, Akapong Suwattanamala¹ and Karaked Tedsree^{1,*}

Copper/zinc oxide-based catalysts are important commercial catalysts for producing methanol in the gas phase using a thermochemical method. In this work, the effects of CeO₂ on Cu/ZnO-CeO₂ catalysts were studied for the photocatalytic reduction of CO₂ to methanol. The CeO₂/ZnO and Cu/CeO₂-ZnO catalysts were prepared by a hydrothermal method and a two-step method, respectively. The particle size, shape, and distribution of the catalysts were characterized by scanning electron microscopy (SEM). Photoluminescence and UV-diffuse reflectance spectroscopy techniques were used to investigate the optical properties of photocatalysts. The crystal structure of the synthesized catalysts was investigated using X-ray diffraction (XRD). The reaction parameters, such as reaction temperature, reaction time, the concentration of additives, and catalyst loadings, were studied to determine the optimal reaction conditions. A gas chromatography-flame ionization detector (GC-FID) detected the amount of methanol production using headspace-solid phase micro-extraction (HS-SPME). At the optimum reaction condition, the yield of methanol was found to be 73 ± 08 mmole/L/g_{cat} under UV light at 365 nm. The high production of methanol by Cu/CeO₂-ZnO catalysts is one of the most promising CO₂ utilization technologies for large-scale industrialization.

Keywords: CO₂ reduction, Copper/Cerium oxide/Zinc oxide nanostructure, Methanol production, Photocatalysis

¹Nanocatalysis Laboratory, Department of chemistry, Faculty of Science, Burapha University, Bangsaen, Chonburi, 20131

*Corresponding another e-mail: karaked@go.buu.ac.th

The development quality of biodiesel oil from blending waste cooking oil with animal fat and castor seed oil

Noppharat Khotsuno^{1,2*}, Sunti Phewphong^{1,2} and Wuttichai Roschat^{1,2}

This research aimed to develop the quality of biodiesel from blending waste cooking oil with animal fat and castor seed oil for use in agricultural diesel engines. The studies found that waste cooking oil and animal fat are mainly composed of oleic acid (C_{18:1}), palmitic acid (C_{16:0}), and linoleic acid (C_{18:2}), respectively. While castor seed oil is primarily composed of ricinoleic (C_{18:1-OH}), linoleic (C_{18:2}), and oleic (C_{18:1}) fatty acids, respectively. The fatty acid composition of castor seed oil affected the chemical and physical properties of castor seed oil biodiesel products such as the viscosity was about 2 times higher than the standard of biodiesel products. When blending the waste cooking oil with animal fat and castor seed oil at different ratios, it was found that the optimal ratios of the feedstock oil for biodiesel production consisted of waste cooking oil to animal fat and castor seed oil was 50: 40: 10 and 50: 30: 20, respectively. The physical properties of the obtained biodiesel product showed an average viscosity of 4.31, a cloud point of -5 °C, and a pouring point of -5 °C compared with B10 and B20 diesel oil. The engine braking power and fuel consumption ratio of biodiesel products obtained from the mixture ratio of 50: 40: 10 and 50: 30: 20 were similar to that of petroleum diesel with a difference of approximately 5%. Therefore, from all the experimental data, it can be seen that the mixture of waste cooking oil with animal fat and castor seed oil has better properties than each oil and the quality meet the specified standard. This method is one of the choices to improve the quality of castor seed oil as raw material oil for use in the production of biodiesel to use in agricultural diesel engines efficiently.

Keywords: Agricultural diesel engines, Animal fat, Biodiesel oil, Castor seed oil, Waste cooking oil

¹ Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

² Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

* Corresponding author email: sayhoy33d@gmail.com

Preparation of *Piper Betle* Linn. extract and MgFe-layered double hydroxide composite by solid-solid reaction

Kunlanid Intaraphet¹, Soraida Bosoy¹, Parichat Thepthong¹, Wankuson Chanasit² and Sonchai Intachai^{1,*}

Herbs have versatile therapeutic properties specifically as antioxidant and antibacterial in medicine, dietary supplements and cosmeceuticals. However herbal extracts are organic compounds whose structure is not stable to light, heat and chemicals, therefore these conditions are limitations in processing into products with requiring intense heat, and acid-base chemicals, and oxidizing and reducing agents. Therefore, the process of stabilizing herbal extracts is an interesting and challenging research. In this work, magnesium iron-layered double hydroxide (MgFe-LDH) was prepared as the host material for mixing with *Piper betle* Linn. extract by solid state method because it has biocompatible components, stable structure, and -OH groups that are active in the formation of many hydrogen-bonds. The as-prepared product was identified by XRD and FT-IR that could confirm the formation of brucite-like structure of LDH and the presence of the characteristic of MgFe-LDH and the organic matter due to betel extract in the composite. For the inhibition of DPPH radical (150 ppm 100 mL) it was found that 5 mg of betel extract, composite material and MgFe-LDH showed the antioxidant activity of 100, 93 and 91 %, respectively, as a result, the powdered composited could be a highly effective antioxidant.

Keywords: *Piper Betle* Linn. extract, layered double hydroxide, composite materials, solid-state method

¹ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

² Department of Biology, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: sonchai.i@tsu.ac.th

Development of composite material based on *Glycyrrhiza glabra* extract and MgFe-layered double oxide by solid-state reaction and antioxidant property

Natnida Nakkliang¹ Soraida Bosoy¹ Parichat Thepthong¹ Wankuson Chanasit² and
Sonchai Intachai^{1,*}

Herbs are essential to human life, which have high nutritional values, especially licorice herb (*Glycyrrhiza glabra*) that is a highly effective antioxidant. Most of the organic herbal extracts are quite unstable on exogenous stimulating-factors. Therefore, the enhancement of stability and antioxidant properties of licorice extract is an interesting and challenging research. Magnesium iron-layered double hydroxide (MgFe-LDH) is an inorganic host material with the stable and environmentally friendly structure and cell compatibility that is commonly mixed with organic compounds. In addition, MgFe-LDH precursor is calcined to fabricate magnetic magnesium iron-layered double oxide (MgFe-LDO). In this research, the extract was prepared from licorice herb, and MgFe-LDO was synthesized by calcining (at 500 °C for 2 h) of MgFe-LDH that carried out by the hydrothermal method. Then, they were mixed by solid state method. The as-prepared samples were verified by XRD and FT-IR, which were able to confirm the formation of MgFe-LDO host-material, and of composite material. It was found that the efficacy for scavenging DPPH radical was of 100, 75 and 89% for licorice extract, MgFe-LDO and composite material, respectively, corresponding to the effects of host-guest and guest-guest interactions.

Keywords: Composite, Antioxidation, Extract (*Glycyrrhiza glabra*), MgFe-layered double oxide,

¹ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

² Department of Biology, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: sonchai.i@tsu.ac.th

Green one-pot synthesis of 3,4-dihydropyrimidinone analogues using celite catalyst

Panida Budsri ¹, Woramon Phloiyotsorn ¹, and Sorachai Khamsan^{2,*}

This research studied on the potential of celite as catalyst for eco-friendly one-pot synthesis of 3,4-dihydropyrimidinone *via* Biginelli reaction. The optimal reaction conditions were performed by using 1.0 mmol aromatic aldehyde, 1.0 mmol ethyl acetoacetate, 1.2 mmol urea and 3% of celite at 80°C for 1 hour to give 3,4-dihydropyrimidinones in high isolated yield (80-90%). The 3,4-dihydropyrimidinone analogues were carried out with the similar conditions to obtain corresponding 3,4-dihydropyrimidinone analogues in moderate isolated yield (20-30%). In summary, this investigation demonstrated the effectiveness of the developed Biginelli reaction including cleaner and shorter reaction times with high yield as well as easier work up.

Keywords: 3,4-dihydropyrimidinone, Biginelli reaction, Celite, Eco-friendly synthesis

¹Demonstration School, University of Phayao, Phayao 56000 Thailand

²Division of Chemistry, School of Science, University of Phayao, Phayao 56000 Thailand

* Corresponding author email: sorachai.kh@up.ac.th

RGB-based quantitation method of ethambutol dihydrochloride for the quality control of tablets

Theerasak Rojanarata^{1,*}, Kanong Ruttanakorn¹, and Thana Thanayutsiri¹

Currently, the United States Pharmacopeia (USP) method for the determination of ethambutol dihydrochloride in the test of tablet dissolution is based on the extraction of the drug, after forming the colored complex with a dye namely bromocresol green, into chloroform, and subsequent measurement of absorbance. However, this method requires an expensive UV-vis spectrophotometer and consists of tedious steps e.g. transferring of liquid and cuvette rinsing. Furthermore, the analysts may expose to harmful chloroform via skin contact or inhalation during the absorbance measurement. To overcome these drawbacks, an alternative assay was developed. In the new method, the yellow organic phases obtained from the extraction were photographed while they were still in the closed extraction tubes using a smartphone camera. The Red- Green-Blue (RGB) values of the yellow areas were then analyzed from the image using a mobile application. The results revealed that $B/(R+G+B)$ values showed a good linear relationship to the drug concentration over the range of 11.9 – 118.5 $\mu\text{g/mL}$ (R^2 of 0.9992). The method was accurate (% recovery of 99.98-100.91%), precise (% relative standard deviation of 0.97-1.17%), sensitive (limit of quantitation of 11.8 $\mu\text{g/mL}$) and free from the interference of excipients in the tablets. The comparison of the assay results obtained from the proposed assay and the USP method showed no significant difference. Since the RGB-based method requires no spectrophotometer and it was more user-friendly in term of the ease and safety of operations, it is feasible for the pharmaceutical quality control of ethambutol dihydrochloride tablets.

Keywords: Ethambutol dihydrochloride, Quantitation, RGB, Tablets

¹ Pharmaceutical Development of Green Innovations Group (PDGIG) and Department of Industrial Pharmacy,
Faculty of Pharmacy, Silpakorn University, Nakhon Pathom, 73000

* Corresponding author email: Rojanarata_t@silpakorn.edu

Speciation and quantification of inorganic phosphate additive in frozen shrimp by ^{31}P -NMR

Sarayut Watchasit¹ and Chomchai Suksai^{2,*}

In this study, inorganic phosphate species of hydrogenphosphate (Pi), pyrophosphate (PPi) and triphosphate (TPi) in frozen shrimp were identified and determined by ^{31}P nuclear magnetic resonance spectroscopy (^{31}P -NMR) in 10% D_2O solution: 100 mM HEPES buffer (pH 7.0) using AMP (adenosine monophosphate) as internal standard. The ^{31}P -NMR signals of Pi, PPi, TPi and AMP were analyzed in the presence and absence of 2.5 mM $[\text{FeEDTA}]^-$ solution. All of spectra in two systems are similar. Pi, PPi and AMP showed the singlet peaks at chemical shift at 1.32 ppm, -8.27 ppm, and 2.87 ppm, respectively, whereas TPi appeared as a doublet peak at the chemical shift of -8.14 ppm and a triplet peak at a chemical shift of -22.78 ppm. Two frozen shrimp samples (sample A and B) were tested in this study. The sample A showed only Pi in which the concentration and % recovery were 1.92 mM and 99, respectively. In the sample B, two species of inorganic phosphate Pi and TPi were found in 17.63 mM and 0.03 mM, respectively. Whereas the % recoveries of Pi and TPi in sample B were 84.87 and 109.20, respectively. Moreover, PPi could not detect in this experiment in both samples. From results, ^{31}P -NMR was an alternative technique which could be used as speciation and quantification of inorganic phosphate anions in frozen shrimp.

Keywords: Frozen shrimp, Inorganic phosphate, ^{31}P -NMR

¹ Nuclear Magnetic Resonance Spectroscopic Laboratory, Science Innovation Facility, Faculty of Science, Burapha University, Chonburi, 20131

² Department of Chemistry, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: jomjai@go.buu.ac.th

Effect of alginate amount on properties of edible film from radish

Satane Phunamung^{1,*}, Anchisa Hankate¹ and Thammasorn Prapatham¹

This research was conducted to study the properties of edible films from radish that have different amounts of alginate in the film mixture by comparing the properties of films with 3 different concentrations of alginate, 0%, 1%, and 2%. All film samples had similar thickness, opacity and vapor permeability which were 0.2 – 0.3 mm, 0.53 – 1.14 A.mm⁻¹, and 0.054 – 0.151 g/(m².day), respectively. The solubility of the 3 films was not significantly different. In terms of moisture content, the 0% film had the highest moisture content (43.8%), higher than that of 1% film (29.6%) and the 2% film (21.1%). The brightness and red values of the three films were not significantly different while the yellowness of the 2% film showed significant difference in yellow value (7.1). From the biodegradability test, it was found that all 3 types of films were easily biodegradable, which completely decomposed within 11 days. The results of this experiment could be used for developing environmentally friendly biodegradable film for food products.

Keywords: alginate, biodegradable film, edible film from radish

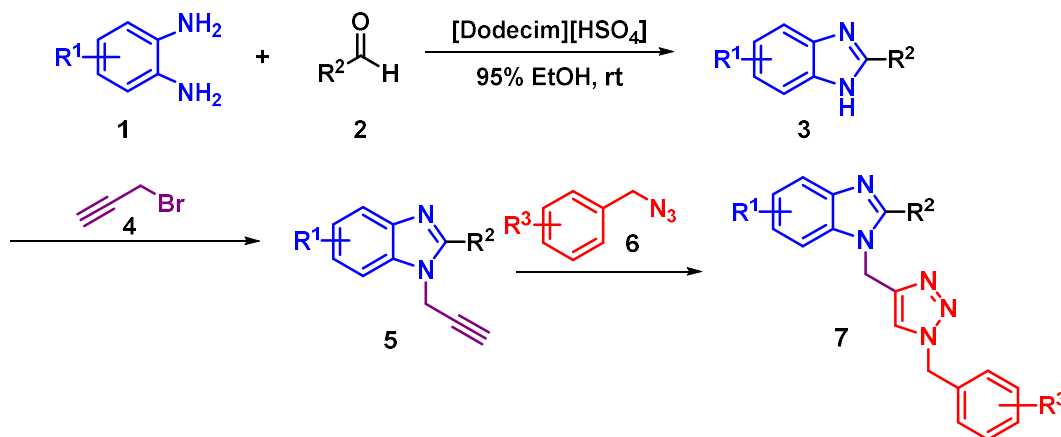
¹ Faculty of Science, Maharakham University, Maharakham , 44150

* Corresponding author email: 6440001@msu.ac.th

Design and synthesis of benzimidazole - triazole derivatives via sequential one-pot three step reaction

Pichamon Masnguluem¹ and Uthaiwan Sirion^{1,2*}

Nitrogen-containing organic compounds are of growing interest in biological activities. Benzimidazoles have been reported as anti-cancer, anti-depressant, and anti-parasitic activities (Senapak et al., 2019). Triazoles exhibited antifungal, antioxidant, and antibacterial activities (Mohammed et al., 2022). Herein, the synthetic method for the synthesis of benzimidazole-triazole derivatives involved 3 step reactions via sequential one-pot synthesis. First step, the condensation reaction of 1,2-phenylenediamines (1) and aromatic aldehydes (2) was employed to form benzimidazole products (3) using [Dodecim][HSO₄] as catalyst under green conditions. Then, without purification step, crude benzimidazole products were reacted with propargyl bromide via *N*-alkylation under base-condition at room temperature for 3 h to afford the *N*-alkylated benzimidazole products (5) in good to high yields. Finally, the *N*-alkylated benzimidazole products were ligated with benzyl azide by click reaction to produce triazole ring. The benzimidazole-triazole products (7) were obtained in good to excellent yields. This approach features mild conditions short reaction process a wild range of substrates and suitable for industrial synthesis process.



Senapak, W., Saeeng, R., Jaratjaroonphong, J., Promarak, V., & Sirion, U. Metal-free selective synthesis of 2-substituted benzimidazoles catalyzed by Brønsted acidic ionic liquid: Convenient access to one-pot synthesis of *N*-alkylated 1,2-disubstituted benzimidazoles. *Tetrahedron*. 2019, 75(26), 3543-3552.

Keywords: Benzimidazole, One-pot reaction, Triazole

¹ Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Burapha University, Sangesook, ChonBuri 20131

² The Research Unit in Synthetic Compounds and Synthetic Analogues from Natural Product for Drug Discovery (RSND), Burapha University, Chonburi 20131

* Corresponding author email: uthaiwan@go.buu.ac.th

Molecular docking study of quinoline derivatives with lysozyme *In silico*

Narumol Petcharat^{1,*}, Jiraporn Sriprajan¹, Suwicha Patnin², Arthit Makarasen²
and Apinya Buranaprapuk¹

Lysozyme has several binding sites for drugs and small ligands to bind for drug delivery in the circulatory system. The study of ligand-protein binding interaction helps us to understand the pharmacodynamics and pharmacokinetics of drugs. Therefore, in this study, binding characteristics of the quinoline derivatives (Fig. 1), 4-(4'-formylphenoxy)-2-(5''-cyanopridin-2''ylamino)quinoline (6a) and 4-(4'-cyanophenoxy)-2-(5''-cyanopridin-2''ylamino)quinoline (6c), the potent against cancer and HIV-1 RT, to lysozyme, the model protein, were investigated using molecular docking method. The binding interactions of quinoline derivatives with human and egg-white lysozymes (PDB ID: 1IP1 and 4HPI, respectively) were simulated by molecular docking using AutoDock 4.2. The ground-state structures of the quinoline derivative structures were optimized by Gaussian 09 program package. The results showed that the quinoline derivatives bound to human and egg-white lysozymes with approximate binding free energy values ranging from -9.09 to -8.81 kcal/mol, respectively. The estimated binding energies revealed that the interactions of the quinoline derivatives with egg-white lysozymes were lower than that with human lysozyme. Comparisons of the binding energies of egg-white lysozymes upon binding to both compounds, egg white lysozymes bound to (6c) with lower binding energy than bound to (6a), suggesting that the bound complexes between egg white lysozymes and (6c) was the most stable. This binding information can be very useful as a guideline for the design of the structure of quinoline derivatives in the future.

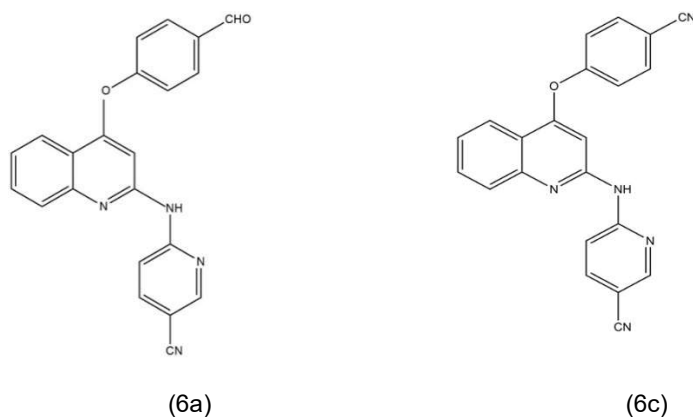


Fig. 1 The structures of this quinoline derivatives

Keywords: Lysozyme, Molecular docking, Quinoline

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110, Thailand.

²Department of Chemistry, Laboratory of Organic Synthesis, Chulabhorn Research Institute, Laksi, Bangkok 10210, Thailand.

* Corresponding author E-mail address : Narumol.petcharat@g.swu.ac.th

**Linear and nonlinear regression methods for optimum methylene blue
adsorption isotherm onto synthesized activated carbon from coffee grounds
impregnated with calcium alginate bead**

Apisit Intachai¹, Patcharathorn Onta¹, Preeyaporn Luerueang¹ and Boontharika Thapsukhon^{1,*}

Batch experiment was carried out to investigate the optimum isotherm suitable to model the adsorption of methylene blue (MB) onto synthesized activated carbon (AC) impregnate with calcium alginate bead. The AC was synthesized from coffee grounds via carbonization method and activated with potassium hydroxide at 500 °C for 30 min. Then, the synthesized AC was characterized by Fourier transform infrared spectroscopy (FTIR), x-ray diffraction spectroscopy and Scanning electron microscopy (SEM) techniques. In order to estimate the equilibrium parameters, the MB solution concentration was 100 ppm and the adsorption time was 300 min. The equilibrium adsorption data were analyzed using the isotherms: Langmuir, Freundlich, Temkin and dubinin-radushkevich (D-R) by applying linear and nonlinear regression methods. In addition, nine linearized isotherm models (including six linearized Langmuir models) and four nonlinear isotherm models were discussed in this study. The error functions which include the Sum of the Squares of the Errors (SSE), root mean square error (RMSE), Average relative error (ARE), Chi-square (X^2), Marquardt's Percent Standard Deviation (MPSD) and the correlation coefficient (R^2) between the calculated and experimental data were also used to compare the suitability of different linearized and nonlinearized model parameters. In conclusion, D-R nonlinear isotherm was found to be having generated the maximum adsorption capacity q_m (159.49 mg/g), highest coefficient of determination R^2 (0.915) and lowest error functions.

Keywords: Activated carbon, Adsorption isotherm, Calcium alginate, Methylene blue

¹ Department of Chemistry, School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: boontharika.th@up.ac.th

Pulse electric assisted extraction of pinostrobin-enriched extract from finger root rhizome (*Boesenbergia rotunda* (L.))

Thanit Metheenukul¹, Pornphimon Metheenukul², Anucha Rikakorn³ and Jukkrin Srivilai^{4,*}

Krachai or Finger root (*Boesenbergia rotunda*) is a plant indigenous to Southeast Asia including Thailand. Thai traditional medicine has acknowledged Finger root therapeutic properties as a carminative and anti-microbial elixir. In addition to being used as a herb, finger root is used in many Thai cuisines. Finger root extract is increasingly being used in the nutritional supplement and cosmetic industries. Many reports have confirmed the effectiveness of Finger root extract in anti-Covid virus, immune activation, and anti-skin aging. Pinostrobin in Finger root is reported as a major chemical constituent and biological activities responsible. This research project aims to develop tools and processes for the extraction of rhizomes from Finger root using the pulse electric method, so that it can be processed faster and with a higher amount of extract than classical ethanol extraction. Pinostrobin contents were determined by HPLC method with relative quantification analysis using percentage from the total area under the curve of the chromatogram. For improved extraction, Finger root was chopped and mashed to increase surface area. Finger root was steeped in ethanol by 7, 15, 30, and 60 days, filtered and analyzed for pinostrobin contents which showed the percentage of 22.5, 22.5, 23.0 and 22.0 weight by volume, respectively. Pulse electrical current was discharged into the chopped and mashed finger root rhizome in ethanol within 116 pulse per minute for 30, 60, 90, 120 and 150 minutes. Interestingly, pulse assisted extraction exhibited the pinostrobin percentage of 28.0, 28.0, 28.25, 27.0 and 30.0 weight by volume, respectively. Optimal condition is the extraction by electric pulse for 90 minutes, because the value is equal to the average value. These results suggested that pulse electrical current could effectively be utilized for pinostrobin extraction from finger root rhizomes by ethanol with faster and more percentages content. The Pulse electric assisted extraction method was faster and more effective than classical method and useful for finger root extraction in herbal industry, food supplement and cosmetic industries.

Keywords: Ethanol extraction, Finger root, HPLC, Pinostrobin, Pulse electrical current,

¹Faculty of Science and Technology Uttaradit Rajabhat University, 27 Injamee Road Tha-it, Muang, Uttaradit 53000 TH

²Faculty of Veterinary Technology Kasetsart University (Bangkok) 50 Ngamwongwan Road Lat Yao, Chatuchak, Bangkok, City Post Code 10900.

³Faculty of Industrial Technology Uttaradit Rajabhat University, 27 Injamee Road Tha-it, Muang, Uttaradit, City Post Code 53000.

⁴School of Pharmaceutical Sciences, Faculty of Pharmacy, University of Phayao 19 M.2 Maeka, Muang, Phayao 56000 TH

*Corresponding author, email: jukkarin.sr@up.ac.th

Study of the ratio between virgin coconut oil and shea butter on the properties of skin care lotion

Thanit Metheenukul¹, Jukkrint Srivilai^{2,*}, Nattanan Sangngew³ and Sirilak Duangsuwan³

Tropical climate of Thailand is abundant for coconut planting. Coconut oil has been used for skin care in Thailand for centuries. The purpose of this study aimed to use natural extracted virgin coconut oil as an ingredient of o/w emulsion dosage form for skin care lotion products. The formula main ingredients, shea butter and virgin coconut oil were studied with different ratios of 5:1, 4:2, 3:3, 2:4 and 1:5 by weight. Emulsion common characteristics were evaluated with pH, viscosity, stability and particle/droplet size. All of lotion formulas showed the pH values between 6.38-6.93, which is close to neutral pH and can be used on human skin. Emulsion viscosity increased with virgin coconut oil content increasing, resulting in better coated on skin. These might be from lauric acid, which is the main constituent in virgin coconut oil. The lotion stability was tested by 5,000 rpm speed centrifugation for 30 mins, it showed that no phase separation for all of emulsion formulas. These implied that the developed product were stable under high centrifugation force. Developed lotion products particle size was 64–180 nm. Interestingly, the weight ratio of 1:5 for shea butter and coconut oil provide the smallest particle size about 64.66 nm, resulting in good texture and better skin absorption. Therefore, virgin coconut oil content increasing can make the smaller particle size in lotion for better absorb in human skin. This work points that coconut oil is good property ingredient for skin care cosmetic and essentially further study in industrial scale.

Keywords: Properties of lotion, Shea butter, Skin care lotion, Virgin coconut oil

¹ Faculty of Science and Technology Uttaradit Rajabhat University, 27 Injaimee Road Tha-it, Muang, Uttaradit 53000 TH

² School of Pharmaceutical Sciences, Faculty of Pharmacy, University of Phayao 19 M.2 Maeka, Muang, Phayao 56000 TH

³ Faculty of Education Uttaradit Rajabhat University, 27 Injaimee Road Tha-it, Muang, Uttaradit 53000 TH

* Corresponding author email: jukkarint@hotmail.com

Simplified removal of heavy metal wastewater: MgFe-layered double hydroxide approach for Cr⁶⁺ treatment

Soraida Bosoy¹, Nureeya bintuan¹, Panita Sumanatrakul¹ and Sonchai Intachai^{1,*}

The contamination of heavy metal in water is becoming a major global issue, which causes the toxic to environment and health. Dichromate or dichromate salt (Cr₂O₇²⁻), comprised of Cr⁶⁺ that categorized a dangerous heavy metal, is negatively-charged structure, well soluble by water, and strong oxidizer. Therefore, the process of removing Cr⁶⁺ contaminant in water must be developed urgently. In this work, magnesium iron-layered double hydroxide was carried out by the hydrothermal method at 120 °C for 16 h as the adsorbent for eliminating Cr⁶⁺ in water. The as-prepared adsorbent was characterized by XRD and FT-IR, which could confirm the formation of magnesium iron-layered double hydroxide that inserted with carbonate ions. For the removal of Cr⁶⁺ (150 ppm 100 mL) in water, it was found that the adsorption percentage was increased with increasing the amount of the adsorbent. The whole amount of Cr⁶⁺ in water was completely captured by using 1.00 g of magnesium iron-layered double hydroxide. As a result, magnesium iron-layered double hydroxide is an effective adsorbent for the removal of anionic heavy metals.

Keywords: Adsorption, Heavy metals, Magnesium Iron Layer Double Hydroxide (MgFe-LDH)

¹Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: intachai.i@tsu.ac.th

The investigation of physicochemical properties of the Roselle (*Hibiscus sabdariffa* Linn.) seed oil

Sunti Phewphong^{1,*}, Aonuma Wonam^{1,2}, Thapanapong Kaisri^{1,2}, Patsorn Duangpakdee^{1,2},
Tappagorn Leelatam^{1,3} and Wuttichai Roschat^{1,2}

This research work aimed to study and compare the physicochemical properties of oil extracted from Roselle (*Hibiscus sabdariffa* Linn.) seed with oil extracted from various plants consisting of palm oil, soybean oil, rice bran oil, sunflower oil, and coconut oil. The results showed that Roselle seed has a mean moisture content of 3.66 ± 0.04 w/w. The mean oil content of Roselle seed extracted by soxhlet extraction was 21.10 ± 0.53 w/w while the physical extraction by using cold pressed screw method was 8.94 ± 0.10 w/w. The fatty acid compositions of Roselle seed oil consisted of 20.35% total saturated fatty acid compound and 79.65% total unsaturated fatty acid compound. The chemical compositions of fatty acids of Roselle seed oil were cis-Oleic acid (C_{18:1}) 37.23%, cis-linoleic acid (C_{18:2}) 34.87%, Palmitic acid (C_{16:0}) 16.81%, Palmitoleic acid (C_{16:1}) 6.42%, Stearic acid (C_{18:0}) 3.55%, and trans-Oleic acid (C_{18:1}) 1.12%, respectively. The chemical composition of Roselle seed oil which was high in unsaturated fatty acids resulted in outstanding physical properties including the cloud point and pour point values below 0 °C. In addition, a study on the chemical properties of Roselle seed oil found that the acid value was high as 5.12 mg KOH/g of oil. From the above study, it can be concluded that Roselle seed oil was suitable as a raw material or ingredient to produce various products such as soaps, body creams and lotions, and herbal massage oils but it was not suitable to be taken orally due to its high acid value and free fatty acids. Therefore, the results study of the physicochemical properties and the chemical compositions of the Roselle seed oil in this research work was an important database for utilizing them as raw material in the production of various products for adding value to agricultural products of the community.

Keywords: Acid value, Cloud point and pour point, Fatty acid composition, Free fatty acid, Physicochemical properties, Roselle seed oil,

¹ Biomass Energy Research Laboratory, Center of Excellence on Alternative Energy, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

² Program of Chemistry, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000, Thailand

³ Appropriated Technology Center, Faculty of Science and Technology, Sakon Nakhon Rajabhat University, Sakon Nakhon 47000 Thailand

* Corresponding author email: sunti-sc@hotmail.com

Removal of methylene blue dye using adsorbent prepared from sugarcane bagasse

Kanlayanee Kajsanthia^{1,*}, Natthanicha Khuabphimai¹, Chatrachatchaya Chotichayapong¹, Pusita Kuchaiyaphum¹, Nikorn Saengsuwan¹ and Worapong Bagnern¹

The adsorption of methylene blue dye in solution using sugarcane bagasse ash was studied. Sugarcane bagasse was modified with HCl 1 M for 3 hours and dried at 105 °C. After that sugarcane bagasse was calcined at 500 °C for 5 hours. The adsorption experiments were conducted in a batch setup. Optimum conditions were observed at sorbent amount 0.050 g, initial dye concentration of 10 ppm, pH 5 and contact time 120 min. The maximum adsorption capacity was 12.98 mg/g. To describe the adsorption behavior with time, kinetic models were tested. The adsorption kinetic data was followed pseudo-second order kinetic model. At the concentration range of 2-700 ppm, the values of the correlation coefficient for Freundlich model was about 0.99.

Keywords: Adsorption, Methylene blue, Sugarcane bagasse

¹ Department of applied chemistry, Faculty of science and liberal arts, Rajamangala university of technology isan, Nakhon Ratchasima 30000

* Corresponding author email: kanlayanee.ka@rmuti.ac.th

Activated carbon from jarul fruit (*Lagerstroemia speciosa* Pers.) by chemical activation with H_3PO_4

Chutikarn Inchan¹, Kongphop Lersakthanakorn¹ and Supachai Wanprakhon^{1,2*}

The objective of this research was to investigate the physical and chemical properties of activated carbon derived from jarul fruit due to the lack of jarul trees. The fruiting season cannot be used for any other purpose besides planting in front of schools. Jarul fruit was carbonized at 500°C for 2 hours, pulverized until it could pass through a sieve, impregnated with phosphoric acid at a concentration of 30%, and activated at 400°C, 500°C, 600°C, and 700°C for 2 hours. The prepared activated carbon was characterized using the iodine number test, scanning electron microscopy (SEM), and energy dispersive X-ray analysis (EDX).

Keywords: Activated carbon, Iodine number, Jarul fruit

¹ Demonstration School University of Phayao, Phayao, 56000 Thailand

² Division of Chemistry, School of Science, University of Phayao, Phayao, 56000 Thailand

* Corresponding Author E-mail Address supachaixxwanprakhon@gmail.com

Effect of temperature on properties of activated carbon from waste bamboo chopsticks prepared from phosphoric acid.

Achiraya Kanta¹, Phetsiri Phuangkham¹ and Supachai Wanprakhon^{1,2*}

Bamboo chopsticks are often discarded as waste. However, bamboo is a type of biomass material that can be used to produce activated carbon. In this study, we used waste bamboo chopsticks to produce activated carbon. Previous research has shown that the best concentration of phosphoric acid to activate activated carbon is 30%. Therefore, we used 30% phosphoric acid to activate the bamboo chopsticks and studied the effect of temperature on the activation process. The waste bamboo chopsticks and their charcoal, which were carbonized at 500°C, were impregnated with 30% phosphoric acid (%w/w) and activated at temperatures ranging from 400°C to 700°C for 2 hours. The resulting activated carbon was characterized using the iodine number test method, energy dispersive X-ray analysis (EDX), and scanning electron microscopy (SEM). The goal of this research was to identify the optimal temperature for producing activated carbon from waste bamboo chopsticks and to reuse the waste material. The best iodine number was 529.19 mg/g at an activation temperature of 600°C, and the best EDX value was 92.75 at the same temperature.

Keywords: Activated carbon, Chemical activated, Iodine number, Scanning electron microscopy, Waste bamboo chopstick

¹ Demonstration School University of Phayao, Phayao, 56000 Thailand

² Division of Chemistry, School of Science, University of Phayao, Phayao, 56000 Thailand

* Corresponding author email: supachaixxwanprakhon@gmail.com

Develop of ethylene absorbent paper from banana leaf sheaf containing activated carbon coated with titanium dioxide

Surassawadee Paliphot^{1,*} and Chammalieng Choawthum²

This study aimed to produce the ethylene absorber paper from banana leaf sheaf containing activated carbon coating with titanium dioxide for prolonging storage life of 'Hom Thong' banana. The activated carbon powders coating with titanium dioxide of 15, 20, 25 and 30% by dry banana fiber weight were added to banana fiber. After forming the paper, the thickness was 378 μm , tensile strength was 6.85 Nm/g and tear strength was 26.69 mN.m²/g. According to the finding of this study, banana paper containing 30% activated carbon and titanium dioxide had the highest ethylene absorber efficiency of 0.049 ppm. Subsequently, the Hom Thong banana was packed in the corrugated box with banana paper containing activated carbon and titanium dioxide stored at 25°C and 50±5% RH for 15 days and tested the banana qualities. The results revealed that banana paper was the most absorber paper for extending Hom Thong banana and it provided the lowest weight loss (6.01%), firmness (105.80 N) and banana peel color ($L^* = 50.05$, $a^* = 7.92$, $b^* = 42.69$)

Keywords: Activated carbon, Ethylene Absorbent Paper, Hom Thong banana, Titanium dioxide

¹ Rajamangala University of Technology Lanna Tak 41/1 Moo. 7, Paholayothin road, Mai Ngam, Muang Tak, Thailand, 63000

² Nakhon Sawan Rajabhat University 398 Moo. 9, Sawanwithi Road, Muang District, Nakhon Sawan, Thailand, 60000

*Corresponding author, email: scisur@gmail.com

Adsorption of hydrogen sulfide in biogas using alkaline-impregnated *Echinodorus cordifolius* biochar as an adsorbent

Surarat Siri-in¹, Tantika Charoenlap¹ and Niramol Juntarachat^{1,*}

In this work, the removal efficiency of hydrogen sulfide in biogas using alkaline-impregnated *Echinodorus cordifolius* biochar (ECB) as an adsorbent was investigated. *Echinodorus cordifolius* was passed through a pyrolysis process to produce ECB. The experiment was then divided into 3 parts. In the first part, the physical and chemical properties of ECB before impregnation in alkaline were determined. The results showed that moisture content, volatile matter content, ash content and fixed carbon value were found to be $5.39 \pm 1.67\%$, $31.29 \pm 1.92\%$, $26.96 \pm 0.59\%$ and 31.36% , respectively. The BET surface of ECB was equal to $3.67 \text{ m}^2/\text{g}$. In the second part, the pH and FTIR of ECB before and after the NaOH impregnation (ECB-NaOH) were measured. It was found that the ECB without and with NaOH impregnation had pH value equal to 9.63 and 11.97, respectively. Finally, a comparison of the adsorption efficiency of ECB and ECB-NaOH was realized using 5 g of adsorbent with the diameter of 1.0 cm. The composition (CH_4 , CO_2 and H_2S) of the biogas before and after absorption was analyzed using chromatography. The Biochar treated with NaOH is most effective, possessing higher adsorption efficiency compared to biochar without alkaline impregnation.

Keywords: Adsorbent, Alkaline impregnation, Aquatic weeds biochar, Biogas, Hydrogen sulfide

¹Department of Chemistry, Faculty of Science, Thaksin University

*Corresponding author, email: niramol@tsu.ac.th

Adsorption efficiency of decanter cake and decanter cake biochar for removing hydrogen sulfide from biogas

Nattiya Khongkuea¹ and Niramol Juntarachat^{1,*}

In this work, the removal of hydrogen sulfide from biogas using palm oil processing wastes: decanter cake and decanter cake biochar as an adsorbent was studied. Decanter cake biochar was prepared by a pyrolysis process at 350°C for 4 hours. In the first step, physical and chemical properties of decanter cake adsorbent and decanter cake biochar were determined to assess adsorption capacity. It was found that moisture contents of decanter cake adsorbent and decanter cake biochar were 10.40% and 4.99%, respectively, pH values of decanter cake and decanter cake biochar were 6.98 and 9.11, respectively. In addition, FTIR results showed N–H stretching vibration and C=C bending vibration in decanter cake but not in decanter cake biochar. The pyrolysis process could remove some volatile compounds from decanter cake. In the second step, adsorption efficiency of two adsorbents with 1.0 cm diameter was investigated using 50 g of adsorbent. The biogas composition (CH₄, CO₂ and H₂S) was measured before and after adsorption in a 30 cm in column length and 4.5 cm diameter using a mobile gas chromatography apparatus. The experimental results showed that the decanter cake adsorbent adsorbed H₂S better than the decanter cake biochar adsorbent.

Keywords: Adsorbent, Biochar, Decanter cake, Hydrogen sulfide

¹ Department of Chemistry, Faculty of Science, Thaksin University

* Corresponding author, email: niramol@tsu.ac.th

ZnO photocatalyst supported on cellulose extracted from sugarcane bagasse for methylene blue removal by filtration under visible light

Jariya Lemmard¹, Suaedah Mamahyamung¹, Netnapid Ongsuwan² and Saowapa Chotisuwan^{3,*}

Preparation of zinc oxide photocatalyst supported on cellulose sheets isolated from sugarcane bagasse for the removal of methylene blue (MB) dye. The cellulose fibers were isolated from sugarcane bagasse by alkaline treatment and used as a support for zinc oxide. The chemical, physical, and morphological properties of cellulose fibers and photocatalyst catalysts were characterized using various techniques, including X-ray diffraction, Fourier transform infrared spectroscopy, and scanning electron microscopy. It was discovered that the isolated fibers have a cellulose content of $97.0 \pm 0.03\%$ with type I cellulose crystals. The dispersion of zinc oxide photocatalysts on cellulose sheets as well as the porosity of the sheets were observed. The MB removal performance was evaluated by filtering 5 mL of a 5 mg/L methyl blue dye solution under visible light irradiation for 5 minutes at room temperature. The percentages of MB dye removal by cellulose and catalyst samples were observed. Cellulose sheets, cellulose sheets with zinc oxide, and cellulose sheets with zinc oxide incorporating silver oxide gave maximum percentages of MB dye removal equal to 94.8 ± 0.01 , 88.8 ± 0.02 , and $68.6 \pm 0.02\%$, respectively. However, the MB dye was still observed on cellulose sheets after filtration rather than on cellulose sheets containing photocatalysts under visible light.

Keywords: Cellulose, Methylene blue, Silver oxide, Zinc oxide

¹Faculty of Education, Prince of Songkla University, Pattani campus

²Department of Food Science and Nutrition, Faculty of Science and Technology, Prince of Songkla University, Pattani campus

³Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani campus

*Corresponding author, email: saowapa.c@psu.ac.th

Developing NiFe-layered double oxide@activated carbon material by solid-solid method

Sineerat Amatsakul¹, Busaya Phramnun¹, Rotjana Chotrungrot¹, Panita Sumanatrakul² and
Sonchai Intachai^{2,*}

The combination of more two phases has been received much interest by solid-solid because of an easy and environmental friendly procedure with no use of harmful chemicals, which shows the integration of each characteristic into the multifunctional composite materials for a wide range of applications. In this work, the composite material (NiFe-LDO@AC) was carried out through the solid-solid method by mixing NiFe-layered double oxide (NiFe-LDO) and activated carbon (AC). Then, the as-prepared samples were characterized by XRD, FT-IR, DR/UV-VIS and the interaction of the product's powder with an external magnet. The results of XRD pattern and infrared spectrum, could confirm the formation of NiFe-LDO@AC composite. Besides, the composite exhibited the absorptivity in visible and ultraviolet light, and the magnetic property.

Keywords: Activated carbon, Composite, Magnet, NiFe-layered double oxide

¹ Undergraduate Student, Bachelor of Education Program, Major in Chemistry, Faculty of Education, Thaksin University, Songkhla, 90000, Thailand

² Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: sonchai.i@tsu.ac.th

Utilization of ZnAl-layered double hydroxide and ZnAl-layered double oxide as an adsorbent for remediating dye-wastewater

Vachiraya Tipros¹, Panita Sumanatrakul¹, Nureeya Bintuan¹, and Sonchai Intachai^{1,*}

The contamination of dye in natural water resource is one of the most serious problems because the dye can cause cancer. The adsorption process is a simple and inexpensive method that provides high dye-removal efficiency in water. However, the development of environmentally friendly and highly efficient adsorbents has been challenging and interesting aspect. In this work, ZnAl-layered double hydroxide (ZnAl-LDH) was synthesized for using as the adsorbent because it has structural stability, good dispersibility in water, environmentally friendly components, large surface area, and positive charged surface. Besides, it can also be synthesized in large quantity by the co-precipitation method. Interestingly, the calcination of ZnAl-LDH at 500 °C for 3 h could be developed as ZnAl-layered double oxide (ZnAl-LDO) adsorbent. For the removal of anionic Congo-red dye (500 ppm) in water, it was found that 3.00 g of ZnAl-LDH and ZnAl-LDO adsorbents exhibited the removal efficiency of 100 and 82 %, where the adsorption capacity at equilibrium was 82 and 67 mg/g, respectively. This study might give an alternative adsorbent for efficiently removing large amount of Congo red dye in wastewater.

Keywords: Adsorption process, Congo red dye, Wastewater treatment, ZnAl-LDH, ZnAl-LDO

Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

*Corresponding author, email: sonchai.i@tsu.ac.th

Nanocellulose as a green template in the preparation of Al-doped mesoporous silica catalysts for glucose conversion to 5-Hydroxymethyl furfural

Panut Saelee¹, Saowaluk Inpaeng¹ and Karaked Tedsree^{1,*}

This work prepared aluminum-doped mesoporous silica catalysts (Al/mSiO₂) using nanocellulose produced from sugarcane bagasse as a green template with cetyltrimethylammonium bromide (CTAB). Nanocellulose can be prepared with nitric acid, sodium hydroxide, and hydrogen peroxide, followed by hydrolysis with sulfuric acid. The product is cellulose nanofibril with an average diameter of 2.31 ± 0.2 nm. The main structure of the mesoporous catalyst was prepared by sol-gel process using tetraethyl orthosilicate (TEOS) and sodium aluminate as precursors with a Si/Al ratio of 15. The effects of catalyst structural and chemical properties with various amounts of nanocellulose template (2.5-50 wt%) were studied. The shape, morphology, and crystallinity of Al/mSiO₂ were investigated by transmission microscopy (TEM) and X-ray diffraction (XRD) techniques. The surface area and pore size of catalysts were analyzed by the BET technique. Lewis and Bronsted acid were determined using pyridine adsorption combined with the Fourier transform infrared spectroscopy (FT-IR) technique. The catalytic performance of Al/mSiO₂ catalysts was tested via the glucose conversion reaction to 5-Hydroxymethyl furfural (5-HMF). The effects of reaction parameters such as temperature, reaction time, THF-to-water ratio, and catalyst loading were studied. It was found that the optimum reaction for the highest 5-HMF yield is using a catalyst with a 25 wt% nano cellulose template at a temperature of 190°C for 2 hours, and the ratio of THF to water is 20:10 mL, the HMF yield was higher than 55%.

Keywords: : 5-Hydroxymethyl furfural, Al/mSiO₂, Nanocellulose

¹Nanocatalysis Laboratory, Department of Chemistry, Faculty of Science, Burapha University, Bangsaen, Chonburi, 20131

*Corresponding another e-mail: karaked@go.buu.ac.th

Magnetic MgFe-layered double oxide as the absorbent for removing Congo red and eriochrome black T dyes

Krongnet Sangthong¹, Phitchayaphak Saenplee¹, Sutida Boonkaew², Chanutnad Chaikaew², Panita Sumanatrakul¹ and Sonchai Intachai^{1,*}

The use of organic dyes is required in large quantities for laboratory, industrial factories and community enterprises, where the rest at unwanted dyes is also largely discharged that causes the contamination of these harmful substances in natural water sources. Therefore, the development of magnetic composite materials as smart adsorbents is an interesting and challenging research for application in the treatment of contaminated wastewater from anionic dye. In this work, a magnesium iron-layered double hydroxide (MgFe-LDH) precursor was synthesized by hydrothermal method at 120 °C for 16 h and then calcined at 500 °C for 2 h to synthesize magnesium iron-layered double oxide (MgFe-LDO). Then, the adsorbent was identified by XRD and FT-IR, which confirmed the formation of MgFe-LDO with 2D structure and a positively charged-surface. For evaluating the adsorbent capacity, 0.50 g of MgFe-LDO was used to remove Congo red as well as eriochrome black T (150 ppm 100 mL) that provided the dye removal efficiency and adsorption capacity (q_e) of 79.70 % and 23.90 mg/g, as well as 73.70 % and 22.15 mg/g, corresponding to the chemical adsorption with electrostatic force.

Keywords: Adsorption, Congo red, Eriochrome black T, Magnesium iron-layered double oxide, Magnet

¹ Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung, 93210

² Bachelor of Education Program, Faculty of Education, Thaksin University, Songkhla, 90000, Thailand

*Corresponding author, email: sonchai.i@tsu.ac.th

Physical and chemical properties of cellulose from *Novacetimonas pomaceti* isolated from kombucha

Rungravee Chaiyod¹, Kittiya Khongkool¹, Nattharika Sinualin², Wankuson Chanasit³
and Monthon Lertworapreecha^{3,*}

Acetic bacteria is a group that can produce acetic acid, which can be used in various industries. In addition, some strains can produce high-purity cellulose. The cellulose produced by these bacteria can be applied in food and medical industries, free from lignin and hemicellulose. This work examines cellulose's physical and chemical properties from *Novacetimonas pomaceti* isolated from kombucha. By analyzing the surface structure of the fibers by scanning electron microscope (SEM), it was found that the cellulose fibers had a smooth surface. It has a detailed reticulated structure. The structure is arranged in nanometer size (63-72 nm). Analysis results for purity. By considering functional groups in the molecules of cellulose fibers Using the Fourier transform infrared spectroscopy (FTIR) technique in the wavelength range between 4000-500 cm^{-1} , it was found that the chemical structure of the fiber consists of important functional groups, namely O-H stretching, C-H, stretching, O-H bending, C-H stretching, C-O-C stretching. C-O-H stretching shows the structure of pure bacterial cellulose.

Keyword: Bacterial cellulose, Fourier transform infrared spectroscopy (FTIR), *Novacetimonas pomaceti*, Physical and chemical properties, Scanning electron microscope (SEM)

¹Biotechnology program, Faculty of Science, Thaksin University, Pa Phayom District, Phatthalung province 93210

²Microbiology program, Department of Biology, Faculty of Science, Thaksin University, Pa Phayom District, Phatthalung province 93210

³Microbial Technology for Agriculture and Environment Research Center, Faculty of science, Thaksin University

*Corresponding author: E-mail address: worapreecha@gmail.com

Development of air cathode electrode for a membraneless alkaline fuel cell prototype

Chakkrapong Chaiburi^{1,*} and Panadda Pannim¹

In this research, the development of air cathode electrodes was studied. The cotton fabric cathode electrodes were prepared by mixing PTFE (%) 10 wt %, 15 wt %, 20 wt %, and 25 wt % with Nafion and carbon powder for diffusion of air entering the cathode side. The study was divided into four parts: the first part was to study the physical characteristics of the fabric surface, pre-measuring carbon in the fuel cell, and studying the physical characteristics of the air cathode surface before measurement in fuel cell. It was found that the prepared cotton fabric has a smooth surface that adheres of ingredients due to the addition of Nafion, carbon powder, and PTFE bind together. The second part studied the leakage-seepage characteristics of cotton fabric in the fuel cell with 0.1 M KOH solution. At 20 wt% of PTFE, there was no surface seepage or leakage of KOH solution. The third part is a physical study of the surface of the cotton fabric after measurements in fuel cell. At 20 wt% of PTFE, the surface will not come off and will not be soaked with 0.1 M KOH solution. In the fourth part, an inlet-out test of oxygen was conducted with 20 wt% of PTFE using oxygen meter. It was found that 20 wt% of PTFE had an oxygen out equal to 98.0%. Therefore, testing in a fuel cell made of 20 wt % PTFE and Nafion of air cathode will provide the highest efficiency and optimum performance.

Keywords: Air Cathode, Alkaline Fuel Cell, Carbon Cloth, Fuel Cell

¹Department of Chemistry, Faculty of Science, Thaksin University, Phatthalung Campus, 222 Moo 2, Papayom District, Phatthalung Province 93210

*Corresponding author, email: chakkrapong@tsu.ac.th

Silver and silver alloy on carbon-supported catalysts for cathodes in PEMFC and DEFC

Siwat Thungprasert^{1,*}, Jennarong Jaikaung¹, Theeraporn Promanan²,
Samroeng Narakaew¹ and Apheruk Chaisenaand¹,

This research was focused on the synthesis of 20% silver, silver platinum alloy, and silver copper alloy catalysts on carbon Vulcan XC-72 supporter for proton exchange membrane fuel cell (PEMFC) and direct ethanol fuel cell (DEFC) cathode using sodium borohydride method. Herein, the ratio of silver sources and platinum or copper source were 1:1 by weight. The obtained catalysts were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM), and investigated the electro-activity performance on single cell testing. XRD, SEM, and TEM results confirmed the catalytic products of the Ag metal, AgPt alloy, and silver copperoxide ($\text{Ag}_x\text{Cu}_{2-x}\text{O}$). Therefore, the particle size of the catalytic AgPt/C was observed in the smallest size about 4.71 ± 1.03 nm. The catalyst was selected to PEMFC and DEFC cathode testing. It showed that high power density was 14.68 and 1.26 $\text{W}/\text{cm}^2 \cdot \text{g}_{(\text{M})}$, respectively.

Keywords: Cathode catalyst, Direct ethanol fuel cells, Proton exchange membrane fuel cell, Silver-based alloy

¹ Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Lampang Rajabhat University, Lampang 52100

² Department of Chemistry, Faculty of Science, Lampang Rajabhat University, Lampang 52100

* Corresponding author email: siwattawis@g.lpru.ac.th

**Photocatalytic activity of mixed metal oxide of cupric oxide/
ferric oxide/ zinc oxide synthesized by microwave method**

Pongthep Jansanthea¹, Nattha Inyai^{1,*}, Kittipos Dokbua¹, Putthadee Ubolsook²
and Aimon Wanaek³

In the present study, mixed metal oxide CuO/Fe₂O₃/ZnO photocatalyst was synthesized by the microwave method for photocatalytic degradation of Rhodamine B solution. The solution precipitation method was employed as a self-sustaining reaction between cupric acetate, ferric nitrate, zinc acetate, and the red grape extract. The different heat treatment was employed by microwave at 450 W for 5 min (Wav), calcine at 300° for 3 h (Cal), and both microwave/calcine (Wav/Cal). The crystal structure of products was characterized by X-ray diffraction (XRD). For evaluating photocatalytic activity under UV light irradiation, Rhodamine B was used as a representative pollutant. The maximum photodegradation efficiency was Wav/Cal synthesized at 450 W for 5 min of heat treatment followed by calcination at 300 °C for 3 hours. The efficiency was 88.43 % with rate constant of 0.0182 min⁻¹ in 120 min.

Keywords Cupric oxide, Ferric oxide, Microwave, Photocatalytic, Zinc oxide

¹Program in Chemistry, Faculty of Science and Technology, Uttaradit Rajabhat University, Uttaradit, 53000

²Program in Environmental Science, Faculty of Science and Technology, Uttaradit Rajabhat University, Uttaradit, 53000

³Program in Physics, Faculty of Science and Technology, Uttaradit Rajabhat University, Uttaradit, 53000

*Corresponding author, email: natthainyai@gmail.com

Poster Presentation

กลุ่มที่ 3 สาขาวิชาคณิตศาสตร์ คณิตศาสตร์ประยุกต์
สาขาวิชาสถิติ

The method for solving variational inequality problem and applying to fixed-point problem of nonexpansive mapping

Anucha Nuisman and Atid Kangtunyakarn*

In this article, we prove a strong convergence theorem for solving variational inequality problems associated with the monotone operator without assuming the existence of such problem. We applied our main result to approximate the fixed-point problem of a nonexpansive mapping. Moreover, we give a numerical example to guarantee some results.

Keywords: Fixed Point Problem, Variational Inequality Problem, Iteration

Department of Mathematics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

* Corresponding author, email: beawrock@hotmail.com

Approximation theorem for fixed point problem and modification of variational inequality problem

Pimpawee Khumsup and Atid Kangtunyakarn*

The purpose of this research article is to introduce the approximation theorem for solving the modification of variational inequality problem, the fixed point problem of κ -strictly pseudononspreading mapping and the variational inequality problem. Then, we prove our result give a method to solve the solution of fixed point problem of κ -strictly pseudononspreading mapping and modification of variational inequality problem associated with inverse strongly monotone operator. In support our result, a numerical example is also presented.

Keywords: Combination of Variational Inequality Problem, Fixed Point Problem, κ -Strictly Pseudononspreading Mapping, System of Variational Inequality Problem

Department of Mathematics, Faculty of science, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

*Corresponding author, email: beawrock@hotmail.com

Proving that the potential infinite series cannot be the variables by determining the amount of odd and even terms in the potential infinite series and substitute into the equation

Phatpasu Rungchat^{*}, Chayapat Wiangnaksansuk and Peeranut Tapsukon

Many mathematicians have studied infinite series and discovered its solution, including Ramanujan. However, when we had studied, we commonly know that the infinite series are positive integers until Ramanujan discovers his summation that contains negative numbers. And that raised questions that the infinite series might have been an error in any steps during the research for the solution. This project is researching to determine the error between Ramanujan's summation and other infinite series to proving that any potential infinite series cannot be in terms of variable. We use mathematical techniques to determine the amount of infinite series that are odd or even terms. By adding the values of the transformed infinite series to the original infinite series has resulted in errors. Therefore, the potential infinite series are obviously cannot be the variables.

Keywords: Infinite Series, Ramanujan's Summation, The Potential Infinite Series

Demonstration School, University of Phayao, Phayao, 56000

* Corresponding author email: 64341595@up.ac.th

**The development of a web application based on a mathematical model
describing the propagation of COVID-19 in Thailand: a case study
for the 5th wave**

Supicha Vongkomalasai^{*}, Phattanaphorn Satakhet and Tirawat Chareonwattanamaneechai

This research aims to create a mathematical model to describe the propagation of COVID-19 for the 5th wave in Thailand and create a web application demonstrating COVID-19 to enhance people understanding of the characteristics of the spread of COVID-19. We create a mathematical model of COVID-19 in Thailand which has the factor of vaccination. The population is divided into susceptible, infectious, quarantined, hospitalized, and recovered groups, and the web application demonstrating COVID-19 is developed so that people could understand the characteristics of COVID-19's spread. The research show that the parameters greatly affect the proportion of infected people such as transmission rate of COVID-19, Home isolation rate of COVID-19, and Hospital admission rate of COVID-19.

Keywords: Covid-19, Mathematical Model, Web Application

Maharakham University Demonstration School (Secondary), Maharakham 44150

*Corresponding author, e-mail: supicha10202005@gmail.com

A predator – prey model: A case study of lady beetles and Mealybugs in agriculture

Arisa Aunruean and Sineenart Srimongkol*

In agriculture, pests are a major problem. Natural pest control seems to be a method that affects the sustainability of the environment. Mealybugs are common pests in agriculture. Studies have shown that lady beetles can reduce the infestation of mealybugs. Therefore, the predator-prey model was used in the study to determine the population density of both species. The numerical results show that the configuration of the parameters affected the characteristics of the model.

Keywords: Predator – Prey Model, Lady Beetle, Mealybug, Agriculture

Department of Mathematics, Faculty of Science, Burapha University, Chonburi, 20131

* Corresponding author email: sineenart@buu.ac.th

The correlation between financial ratios and stock price of Charoen Pokphand Group Companies listed on the stock exchange of Thailand

Naphasorn Khuanari^{1,*} and Apisak Chairojwattana²

People get more interest in investing. Knowledge of investing in the stock market is very important. To invest in the stock, it is necessary to see the company's turnover. The companies listed on the Stock Exchange of Thailand will disclose financial statements to tell the company's turnover. In this section of the financial statements, financial ratios can be analyzed. Therefore, this research aims to study the correlation between Financial Ratios and the Stock Price of the company. This case study collected financial statements of 4 companies in the Charoen Pokphand Group listed on the Stock Exchange of Thailand (SET) consisting of CPF, CPALL, MAKRO, and TRUEE. Use data to analyze financial Ratios. The statistics used consist of Pearson Correlation Analysis and Multiple Regression Analysis.

The result found the Financial Ratio variables that affected the Stock Price (SP) consist of Quick Ratio (QR), Debt to Assets Ratio (DA), Debt to Equity Ratio (DE), Interest Coverage Ratio (ICR), Price to Book Value Ratio (PBV) at $R^2 = 53.89\%$ and Adjusted $R^2 = 51.62\%$, means this prediction equation can be explained the Stock Prices uncertainly with the Analysis of Variance of the value of F statistic = 23.76 and P-Value = 0.000. The estimated Prediction equation is:

$$SP = - 26.92 QR + 94.0 DA - 7.87 DE - 1.009 ICR + 3.443 PBV.$$

Keywords: Stock Price, Financial Ratios, Multiple Regression Analysis, Charoen Pokphand Group

¹ Piboonbumpen Demonstration School Burapha University, Chon Buri, 20131

² Faculty of Science, Department of Mathematics, Burapha University, Chon Buri, 20131

* Corresponding author email: 29175@stgo.buu.ac.th, jina91kh@gmail.com

Alternative Selecting the Demonstrating Schools of School of Education Student, University of Phayao using Decision Making Problems

Kultida Kumsuk¹, Jeeraphat Chaingkaew¹, Panida Suriyamanee¹ and Suebkul Kanchanasuk^{2,*}

The study on alternative selecting the demonstrating schools of students from the School of Education of University of Phayao using decision-making problems (DMP) is quite a challenge for helping the best-selected choice of the student. The DMP algorithm in this study is based on the fuzzy soft sets over semigroups using Minkowski's distance in 2022 from Suebsan and Kanchanasuk. The collected data used in this study included the five parameters in Good Atmosphere and working environment, Safety Transportation, School Management System, Academic System Quality, and Standard Rewards. Moreover, the two surveyed students selected distinctly the five alternating demonstrating schools (O1-O5) which applied to this algorithm. The result showed that the alternative of student 1 is O3, O4, O5, O1, and O2 when using the average score without using DMP algorithms as well as $p=1$ of Minkowski's distance. Nevertheless, the result of $p>1$ showed that the alternative is O3, O4, O1, O5, and O2. Surprisingly in student 2's result, the alternative of the average score and $p=1$ of Minkowski's distance are O2, O1, O3, O4, and O5 while O1, O2, O3, O4, and O5 is the result when $p>1$. The various students' majority decisions on this situation will be applied in the future.

Keywords: Fuzzy Soft Set, Decision Making Problems, Alternative Selecting, Minkowski's Distance

¹ Department of Mathematics, School of Education, University of Phayao, Phayao 56000

² Department of Mathematics, School of Science, University of Phayao, Phayao 56000

* Corresponding author email: suebkul.ka@up.ac.th

Poster Presentation

กลุ่มที่ 4 สาขาวิชาวิทยาศาสตร์ศึกษา

และคณิตศาสตร์ศึกษา

The effect of SAQ training on the agility of Exercise Science and Sports students in the futsal course

Thawanrat Kanthorn, Thanwarat Kanthorn, Tanatchaporn jajjumba^{1,*} and Kritsada Tampradit²

The objectives of this study were to study and compare the effect of SAQ training on the agility of exercise science and sports students. The participants were Exercise Science and Sport 3rd year student: 10 people were selected by purposive sampling and grouped into a matching group. Exercise intervention for 4 weeks every 3 days. At baseline Time after the agility test between the untrained group and the SAQ-trained group. After 4 weeks of training, after the agility test, the untrained group had no difference between before and after training, while the trained group had a difference between before and after SAQ training. It could be concluded that SAQ training results in more agility.

The results showed that

1. Comparison of the effect of SAQ training on agility Before and after 4 weeks of training, the training groups were significantly different at the.05 level.

2. In the comparison of the effects of SAQ training on agility between the untrained group and the trained group, it was found that the difference was statistically significant at the.05 level.

Keywords: Agility, Agility test, SAQ Training

¹ Exercise and sport science School of Science, University of Phayao, Phayao, 56000

² School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: Kitsada_y@hotmail.com

Effects of research based learning with flipped classroom on critical thinking and learning achievement in chemistry of grade 12

Apiradee Pansing^{1,*} and Chanyah Dahsah²

This research aimed to study effect of research-based learning with flipped classroom on critical thinking and learning achievement in chemistry of grade 12. By means of Purposeful Sampling, thirteen Grade 12 students in a science-mathematics stream from a Bangkok school were selected as participants. The research instrument consisted of 1) Lesson Plan 2) Critical Thinking Test based on Ennis and Millman's Cornell Critical Thinking Test Level X and 3) achievement test. Data were analyzed using mean (\bar{x}), standard deviation (S.D.), and t-test one-group. The results showed that critical thinking and learning achievement in chemistry by research-based learning with flipped classroom posttest higher than the criteria of 70 percent with statistical significant at the level of .05.

Keywords: Critical Thinking, Diversity, Learning Achievement in Chemistry, Research Based Learning with Flipped Classroom

¹ Graduate Student, Master's degree in Science Education, Faculty of Science, Srinakharinwirot University.

² Assistant Professor at Science Education Center, Faculty of Science, Srinakharinwirot University

* Corresponding author email: apiradee.pan@g.swu.ac.th

**Administration of STEAM education learning through Creativity-Based Learning
for encouraging to Competency & Skills in the 21st century
for secondary 1 students**

Suchanun Dangjanta^{1,*}, Saitharn Khamainlao¹ and Duangjan Kaewkongpan¹

The purpose of this research is to study 1) Higher Order thinking competency 2) Teamwork collaboration competency 3) the skills of the 21st century 4) The attitude toward the science of secondary 1 students. After being organized on the concept of STEAM education, using creative teaching as the basis of this research is an action-based study Research. Of the 40 people who took this study, The tools used in the research are 1) An educational learning plan based on STEAM educational learning using Creativity-based teaching. 2) Higher Order thinking competency assessment. 3) Teamwork collaboration competency assessment. 4) Skill-based in the 21st-century assessment. 5) The attitude toward the science assessment. The statistical data analysis includes the mean and standard deviation. The results of this study showed four significant findings: 1) Higher Order thinking competency was higher than expected; 2) Teamwork collaboration competency, is at a level of ability; 3) Has good 21st Century skills; and 4) Having a high attitude toward science.

Keywords: Creativity-Based Learning, Higher Order thinking competency, Teamwork collaboration competency, The Concept of STEAM Educational, The Skills of the 21st Century

¹ Department of General Science, Faculty of Science, Lampang Rajabhat University, Lampang, 52100

* Corresponding author, email: suchanun5219@gmail.com

Detection of *Vibriospp.* in a closed system saltwater fishtank from the Institute of Marine Science, Burapha University

Kittin Chanchotsathian¹, Tawanrath Chumsri¹, Nutwarin Mansilp¹, Janjarus Watanachote²
and Piyanoote Jaihan^{3,*}

Vibrio spp. are aquatic microorganisms that cause diseases in the internal organs in aquatic animals. The aim of this study was to analyze and classify *Vibrio* spp. from closed system fish tanks in the Institute of Marine Science, Burapha University, and natural water source, in order to create a useful database. Samples were taken from 7 closed system saltwater fish tanks including Mangrove fish tank, Coral reef fish tank, Moray eel tank, Golden Toothless Trevally tank, Jellyfish tank, big tank, filtered seawater and water from the natural water source of Bang-Phra Sea. The samples were analyzed by using physical and microbiological analysis, including culturing on TCBS agar to test for the ability of pathogen growth at different salinities and resistance of bacteria at different temperatures. The results showed that *Vibrio* spp. were found in 3 tanks (9 isolates) and 3 isolates were found in the natural water source. Based on the experiment and data analysis, the *Vibrio* spp. which found in the 4 water sources were classified into six main types: *V. parahaemolyticus*, *V. cholerae*, *V. mimicus*, *V. fluvialis*, *V. furnissii* and *V. vulnificus*. All of the *Vibrio* spp. found in fish tanks were less prevalent than those found in natural water source, and the *Vibrio* spp. found in the fish tanks did not meet the criteria for causing disease in marine animals. This suggests that the closed system saltwater fish tanks at the Institute of Marine Science, Burapha University have an effective filtering system that meets the standard criteria.

Keywords: Marine Science, *Vibrio* spp.

¹ Piboonbumpen Demonstration School, Burapha University

² Institute of Marine Science, Burapha University

³ Science Classrooms in University-Affiliated School Project, Science Burapha University

* Corresponding author, email: Piyanoote.ja@buu.ac.th

**Development of science process skills by using Inquiry-Based Learning (5E)
together with questioning techniques in photosynthesis study unit for
junior high school students**

Phatcharapa Khongman¹, Yuttana Chaijalearn², and Phitsanuphakhin Chaimongkhon^{3*}

This research aims to develop experimental science process skills and study the satisfaction of learning management by inquiry-based learning (5E) together with questioning techniques on the photosynthesis learning unit. The sample consisted of 34 Grade 7 and 8 students of Mae Pong Pracha Samakkee School, drawn by random selection. The tools used include learning management plans, traces of learning, and notes after teaching, which have been evaluated by experts. The research results showed that for the experimental science process skills, the students were able to perform experiments at a good level with a score of 2.852; the experimental design was good with a score of 2.529; and the recording of experimental results was at a moderate level with a score of 2.441. The level of satisfaction with learning activities was very high. It consisted of activities that were suitable for the content, with the highest average score of 2.800, followed by learning atmospheres that offered opportunities to participate in activities, with an average score of 2.700, and enthusiasm for learning, with the lowest average score of 2.300.

Keywords: Inquiry-Based Learning, Photosynthesis, Questioning Techniques, Science Process Skills

¹ Biology Program, Faculty of Education, Chiang Mai Rajabhat University, Chiang Mai 50300

² Department of Chemistry, Faculty of Science and Technology, Thepsatri Rajabhat University, Lop Buri 15000

³ Department of Biology, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai, 50300

* Corresponding author, email: phitsanuphakhin_cha@cmru.ac.th

Integrating Automatic Item Generation techniques with Python and LaTeX to create dynamic animation worksheets focusing on a projectile motion

Piyapong Sitthison^{1,*}

The Automatic Item Generation (AIG) technique is employed with a feature to generate an animated graphic for a physics problem focusing on projectile motion. The goal of the item is to create an experimental worksheet based on physically accurate short animations contained within a PDF file. The project utilizes MS-Excel, Python, and LaTeX to store database information, perform calculations, and publish the worksheet. In less than a minute, a unique worksheet is generated. By incorporating animated graphics into the worksheet, instructors can promote experimental-based learning.

Keywords: AIG, Automatic Item Generation, Projectile Motion, Physics Lab Simulation

¹ Department of Physics, Faculty of Science, Srinakharinwirot University, 10110

* Corresponding author email: piyapongs@g.swu.ac.th

**The development of skills drills in cooperation with Inquiry-Based Learning
management to promote the ability to solve chemical problems on title
“Factors affecting Chemical Equilibrium” of the fifth grade
of secondary level students**

Anodar Ratchawet^{1*}, Patcharaporn Pun-ake², Chonlasith Lodekaew² and Yuttana Chaijalearn²

The objectives of this research were: 1) to study the efficiency of the skill drills in the title of “ Factors affecting the chemical equilibrium”, and 2) to study the ability to solve chemical problems of the fifth grade, secondary level students after passing through the use of the created skill drills. The sample group in the research was 25 students in the second semester of the academic year 2022 by using a classroom random sampling method as a random unit for one classroom. The research instruments were: 1) Exercises for enhancing problem-solving skills on the title “factors affecting chemical equilibrium” 2) Learning management plans about “factors affecting the chemical equilibrium” and 3) teacher's post-teaching notes. By analyzing the data, content analysis was used from the science concept measurement form and verified credibility by checking the data in a triangular way. (Investigator triangulation). The results showed that 1) Efficiency Determination of skill-enhancing drills on title “factors affecting chemical equilibrium” cooperated with the inquiry-based learning, management had process efficiency (E1) and outcome efficiency (E2) were 76.68/78.66 overall, higher than the criteria set at 75/75. 2) The ability of students to solve chemical problems with the inquiry-based learning management approach (5E) combined with exercises on “factors affecting chemical equilibrium” for the fifth-grade, secondary level students, found that the majority of students were able to solve chemistry problems using skill-based exercises better than the past.

Keywords: Ability in Solving Chemistry Problems, Inquiry-Based Learning Management, Skill Drills

¹ Chemistry Department, Faculty of Science and Technology, Chiangmai Rajabhat University, Tambol Chang Pungek, Mhung Chiangmai, Chiangmai,Thailand, 50300.

² Chemistry Department, Faculty of Science and Technology, Thepsatri Rajabhat University, Tambol Thalechoopsorn, Mhung Lopburi, Lopburi, Thailand, 15000.

³ Department of Biology, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai, 50300

* Corresponding author email: anodar_rat@g.cmru.ac.th

Poster Presentation

กลุ่มที่ 5 สาขาวิชาคอมพิวเตอร์
เทคโนโลยีสารสนเทศ วิทยาการข้อมูล

**Management online examination system (QLMS server) case study midterm and final examinations online in the COVID-19 pandemic situation,
University of Phayao**

Phet Phongshei^{1,*}

The purpose of this research is to design management. Online Examination System (QLMS Server) Midterm and Final Exam Case Study 2021 Online in the Situation of the COVID-19 Pandemic University of Phayao In order to be able to accommodate more than 1,300 students taking online exams at the same time, designed according to the SDLC system, the development cycle of the online exam booking system consists of 2 processes: 1. Designing an online exam booking system by using PHP language and SQLserver database 2. Designing a network Server used for online exams The research found that the QLMS Server system can support the number of students who take online exams at the same time up to 1,558 from the real exam results. In the online final exam, subject 241111[3] - Mathematics 1, the evaluation results and overall satisfaction were at the highest level with a mean of 3.44 and a standard deviation (S.D.) of 0.88. In summary, the design of an online exam management system. Achieves the objectives set out in this research and can support users. Effectively able to meet the needs of the use of information systems both at the operational and strategic levels according to the university's policy in order to achieve the academic service mission with knowledge and innovation efficiently according to the University of Phayao development plan for the year 2022 - 2026, as well as helping to save the university's budget in purchasing software used to organize expensive online exams effectively.

Keywords: QLMS Server, UP LMS, Web Server, Windows Server

¹ Unit of Innovative Learning Development, Innovative Learning Institute, University of Phayao, Phayao, 56000

*Corresponding author, email: phet.ph@up.ac.th

The solution-sample manipulation uses programmable linear actuator for the well-plate colorimeter analysis

Ekboonya Srisook¹, Watcharin Yodmuang¹, Somrit Unai^{1,2,*}, Kridsada Luangthongkham^{1,2}

The demand for efficient and reliable systems for automated sample analysis is increasing, particularly in the field of agriculture. This work presents a novel approach to programmable linear actuation, integrating a syringe pump and an XYZ-linear actuator based on stepper motors with micro-step drivers and Arduino UNO Mega2560 controllers. The system's primary objective is to load soil solution extract samples and NPK test kit solution onto a well plate for a colorimetric analysis system, allowing for accurate and efficient measurement of the NPK test kit. By utilizing precise linear motion control and programmable automation, this system provides high levels of repeatability and accuracy, which is essential for accurate analysis in agricultural research. Furthermore, the proposed system is versatile and can be adapted to suit other applications that require precise linear motion control.

Keywords: Arduino Mega2560, Colorimetric Analysis System, Micro-Step Drivers, NPK Test Kit, Soil Solution

¹ Demonstration School University of Phayao, Phayao 56000, Thailand

² Innovative Department of Physics, School of Science, University of Phayao, Phayao 56000, Thailand

*Corresponding author, email: somrit.un@up.ac.th

The Rexpert: A system for clustering the research results of computer researchers with data mining techniques for recommending similar research results

Chaisiri Sanitphonklang¹, Sirithip Wasinrat², Teerasakand Khoployklang³
and Kobthong Ladkhum^{4,*}

One of the most significant obstacles for young researchers at the graduate and undergraduate levels is having to search for research results to guide their work or create research. In order to reduce these barriers, this research had been developed to create a prototype of a research clustering using a data mining technique from the K-Means algorithm for recommending similar studies when searching for research known as Rexpert. It consists of 2 processes: 1) Data mining abstracts from research articles; the data used in this research are abstracts from 500 computer research articles from the Scopus database to prepare the data by extraction keywords method, Then use them to create a keyword matrix table for clustering similarity data with the K-Means algorithm and find the appropriate number of clusters with the Elbow method for clustering, resulting in 3 clusters. 2) Developing a research search system from the information through process 1. The results found that clustering abstract data from research articles led experts to assess the grouping accuracy at 80.91%. This study can help group other sciences to assist in data retrieval.

Keywords: Abstract, Datamining, K-Means, Elbow Method

¹ Department of Computer Science and Artificial Intelligence, Faculty of Science, Chandrakasem Rajabhat University, Bangkok, 10900

² Department of Applied Statistics, Faculty of Science, Chandrakasem Rajabhat University, Bangkok, 10900

³ Department of Mathematics, Faculty of Science, Chandrakasem Rajabhat University, Bangkok, 10900

⁴ Department of Information Technology and Digital Innovation, Faculty of Science, Chandrakasem Rajabhat University, Bangkok, 10900

*Corresponding author, email: chaisiri.s@chandra.ac.th

Construction of an AI electronic nose system for characterization of a coffee aroma map in Chiang Rai province

Wittaya Pulsawad¹, Komkrich Kaewpanus², Anusorn Tong-on³, Meechai Thepnurat¹,
and Parinya Saphet^{3,*}

Chiang Rai province in northern Thailand is now known for its unique and distinct Arabica coffee aroma, thanks to the region's highland climate and topography. To add value and promote this aroma, a team of researchers developed an AI electronic noses system that detects and maps the coffee aroma from different areas of Chiang Rai. The system uses several gas sensor detectors that can detect gas in the range of 10-1000 ppm, covering 10 different gases from coffee beans. Detectors are connected to an Arduino ESP32 processor board and controlled by a Python program. The system responds to the sensor for measuring the coffee aroma and transmits data via the internet WIFI in the form of IOT protocol. It then sends data to store on a cloud web service and displays real-time coffee aroma maps on an online website. These maps can provide valuable insights into the distinct aroma of coffee beans grown in different areas of Chiang Rai. Moreover, the data collected can be used to develop AI electronic noses that can identify the unique aroma of coffee beans grown in the area. This will further enhance the collection of coffee aroma maps and add value to the coffee beans produced in Chiang Rai. The aroma maps can also help in the branding and marketing of the coffee beans, making it more recognizable and appealing to consumers worldwide.

Keywords: AI Electronic Noses, Arduino ESP32, Gas Sensor Detectors

¹ Program of Mathematics Education, Faculty of Education, Chiang Rai Rajabhat University, Chiang Rai, 57100, Thailand

² Program of Biology Education, Faculty of Education, Chiang Rai Rajabhat University, Chiang Rai, 57100, Thailand

³ Program of Physics Education, Faculty of Education, Chiang Rai Rajabhat University, Thailand, 57100, Thailand

*Corresponding author email: em_parinya_s@crru.ac.th

Database of natural compounds and potential bioactivity of dietary supplement products

Arisa Worathongchai¹ and Pitak Sootanan^{1,*}

When people pay attention to their health, therefore, dietary supplements are being used. Dietary supplements can be purchased over-the-counter or online, so consumers need to be mindful of their safety by choosing products that are approved by the Food and Drug Administration. In this study, we are interested in bringing the announcement of the Food and Drug Administration on the recommendation for the use of natural compounds in dietary supplements to design and develop a database of natural compounds and biological activity of dietary supplements. This initial database contains 12 tables (entities) and 52 fields (columns or attributes), containing information on 15 plants, 24 active substances or natural compounds, and 12 dietary supplement samples. More information about the eligibility and conditions that should be received per day is collected. Therefore, the researcher hopes that the preparation of this database will be a part in further developing it as a dietary supplement for the benefit of entrepreneurs and interested consumers in the future.

Keywords: Bioactivity assay, Database, Dietary Supplement Products, Natural compounds

¹ Department of Biochemistry, Faculty of Science, Burapha University

*Corresponding author, email: pitak@buu.ac.th

Poster Presentation

กลุ่มที่ 6 สาขาวิชาฟิสิกส์ พลังงาน ดาราศาสตร์
และวัสดุศาสตร์

Development of meltblown nonwoven fabric with antibacterial activity by ZnO/AgBr nanocomposites coating

Chitipat Chanasuek¹, Mada Boonruanglue¹, Nawarat Piromruk¹ and Paveena Laokul^{2,*}

The aim of this study is to develop a mask filter layer of meltblown nonwoven with antibacterial activities by coating with a ZnO/AgBr nanocomposite solution (nanosol). To determine a suitable coating volume, the nanocomposite solution was sprayed in different volumes (6, 10, and 14 ml) onto a 12 × 8 cm² nonwoven meltblown fabric. The prepared samples were analyzed for chemical composition and morphology using Fourier transform infrared (FT-IR), scanning electron microscope (SEM), and X-ray diffraction (XRD). To investigate the effectiveness as a filter layer, air permeability was measured according to ASTM D 737 : 2004 and antibacterial activity of Gram-positive (*S. Aureus*) and Gram-negative (*K. pneumoniae*) was performed according to ASTM E 2149-13. The results showed that the most suitable amount of nanosol for coating was 6 ml, with excellent antibacterial activity of more than 99.99% and air permeability values at the standard level. The percentage of air permeability was reduced by 1.50% compared to the uncoated meltblown nonwoven fabric. The findings from this study can be further utilized in the manufacture of a commercial mask filter.

Keywords: Antibacterial Activity, Mask Filter Layer, Meltblown Nonwoven Fabric, Nanocomposite, ZnO/AgBr

¹ Maharakham University Demonstration School (Secondary), Maharakham, 44150

² Department of Physics, Faculty of Science, Maharakham University, Maharakham, 44150

* Corresponding author email: paveena@msu.ac.th

Comparison of surface microhardness of restorative resin composite with different types of fillers

Nilobol Wongsaita¹ and Morakot Piemjai^{1,*}

The study compared the surface microhardness of two restorative resin composites having different types of filler composition. Two groups of the light-cured resin composite in 4x4x2 mm³ dimension (n = 5), (1) Clearfil AP-X and (2) Filtek Z350XT, were tested with Vicker microhardness. Eight indentations were carried out in each specimen with a diamond head at a 100 g loading for 15 s. The average data were analyzed with an independent t-test. Both of the groups were statistically significant different (p < 0.05). Clearfil AP-X (115.19 VHN), the resin composite of various glass fillers, had higher surface microhardness than Filtek Z350XT (90.19 VHN), having part of zirconia particles. In conclusion, the type of fillers can affect the surface microhardness of resin composite. Having higher-hardness filler, such as zirconia, decreases the surface microhardness of resin composite restorative material.

Keywords: Inorganic Filler, Restorative Resin Composite, Surface Microhardness

¹ Department of Prosthodontics, Faculty of Dentistry, Chulalongkorn University, Bangkok, 10330

* Corresponding author email: tmorakot@chula.ac.th

The color masking ability of resin composite with different types of fillers

Kotcharat Nantasen¹ and Morakot Piemjai^{1,*}

Direct restoration with resin composite is becoming increasingly prevalent as a treatment for tooth discoloration. A resin composite that effectively masks color with a thinner application can help reduce the amount of tooth structure lost during the color masking process. This research aimed to compare the color masking ability between resin composite containing organic and inorganic fillers at different thicknesses. Two types of resin composites (Metafil CX shade A1 and Filtek Z250 shade A1) with four thicknesses (0.5, 1.0, 1.5, and 2.0 mm) were employed in this study to mask the dark color of light-cured resin composite blocks (shade A6). The color masking ability was detected using a spectrophotometer. Data assessed using One-way ANOVA found significant differences between the resin composites and among thicknesses ($p < 0.05$). Bonferroni's test revealed the significantly higher potential masking ability of Metafil CX than that of Filtek Z250 in every thickness. In conclusion, the types of filler used in the resin composite can significantly impact its ability to mask color. Metafil CX with organic filler has a more capacity than Filtek Z250 with inorganic zirconia filler in achieving optimal color masking results.

Keywords: Color Masking of Restorative Resin Composite, Organic and Inorganic Filler, Spectrophotometer

¹ Department of Prosthodontics, Faculty of Dentistry, Chulalongkorn University, Bangkok, 10330

* Corresponding author email: tmorakot@chula.ac.th

Dielectric and improved energy-storage properties in complex perovskite (1-x)NaNbO₃-xBi(Li_{1/3}, Sn_{2/3})O₃ lead-free ceramics

Pathit Premwichit¹ and Sasipohn Prasertpalichat^{1,2,*}

Sodium niobate (NaNbO₃, NN) is considered to be one of the most promising lead-free antiferroelectric perovskites materials for energy-storage capacitor applications due to its low cost, light-weight, and non-toxic advantages. However, the energy storage capability of this material is often greatly hindered by the hysteresis exhibited during the transition from the antiferroelectric to the ferroelectric phase. In this study, lead-free (1-x)NaNbO₃-xBi(Li_{1/3}Sn_{2/3})O₃ (x = 0.0-0.08) ceramics were prepared by solid-state reaction method. The crystal structure was found to change from orthorhombic to pseudo-cubic at x ≥ 0.06. With increasing Bi(Li_{1/3}Sn_{2/3})O₃ content, it was found that the AFE *P* phase was successively replaced by the AFE *R* phase, giving the ceramic a thin *P-E* loop characteristic corresponding to the relaxation behaviours. This is beneficial to the improvement of the energy storage properties of ceramic capacitors, leading to a relatively high recoverable energy storage density ($W_{\text{rec}} = 0.56 \text{ J/cm}^3$) and efficiency ($\eta = 74 \%$) at x = 0.06 under an electric field of 120 kV/cm. The optimum composition (x=0.06) also exhibited excellent stability of the energy storage properties with less than 15% variation in W_{rec} in the temperature range of 25–100°C. In addition, an increase in Bi(Li_{1/3}Sn_{2/3})O₃ can lead to a decrease in the leakage current density, which is advantageous in modulating the energy storage performance of dielectric ceramics.

Keywords: Energy Storage Properties, Lead-Free Ceramics, NaNbO₃

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: sasipohnp@nu.ac.th

**Effects of Na excess on the phase structure and electrical properties of
(Bi_{0.487}Na_{0.487}K_{0.06}Ba_{0.026})TiO₃ lead-free piezoceramics**

Wanchaloem Maitreesittikorn¹, Pathit Premwichit¹ and Sasipohn Prasertpalichat^{1,2,*}

In this research, (Bi_{0.487}Na_{0.487}K_{0.06}Ba_{0.026})TiO₃ ceramics were prepared by conventional solid-state mixed-oxide method to incorporate Na excess according to the chemical formula (Bi_{0.487}Na_{0.487+x}K_{0.06}Ba_{0.026})TiO₃, where $x=0.0, 0.005, 0.010, 0.015$ and 0.020 . The crystal structure, dielectric, ferroelectric and piezoelectric properties were systematically investigated with respect to the amount of Na excess. X-ray diffraction data identified pure perovskite structure for all compositions. The pseudocubic structure was observed for $x=0.0-0.005$ before it transformed to rhombohedral structure at $x \geq 0.010$. The grain size tended to be larger with increasing Na excess amount. Increasing x also led to a substantial increase in ferroelectric-relaxor (T_{F-R}) transition temperature from 80°C ($x=0$) to 110°C ($x=0.020$). With increasing x from 0 to 0.020, the standard polarization-electric field (P - E) hysteresis measurements revealed a reduction of remanent polarization (P_r) from 32.3 to 27.9 $\mu\text{C}/\text{cm}^2$, together with an increase in coercive field (E_c) from 32.2 kV/cm to 33.3 kV/cm, which was further confirmed by the remanent P - E hysteresis measurements. In addition, the piezoelectric constant (d_{33}) was also found to steadily decrease as x increased. The observation of increased T_{F-R} and E_c along with a decrease in d_{33} and P_r indicated a stabilization of ferroelectric order induced by Na excess. This research highlights the importance of sufficient control of A-site stoichiometry and how it affects the ferroelectric and piezoelectric properties of BNT-based ceramics.

Keywords: Dielectric Properties, Ferroelectric Properties, Lead Free BNT-BKT-BT, Na-Excess, Piezoelectric Properties

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: sasipohnp@nu.ac.th

Identification of low-temperature heated ruby samples using FTIR spectra

Aumaparn Phlayrahan^{1,*} and Sudarat Khunmee¹

The low-temperature heat treatment is slowly dominating the gem market. This technique of treatment was used to remove the blue tint from the red stones to make their appearance more desirable. In addition, it is hard to apply only the basic gemological technique to distinguish those treated stones from the natural ones. In this study, the ruby samples from Mogok, Myanmar, Mozambique, and Madagascar were heated at low temperatures from 500 to 1000 °C under an oxidizing atmosphere for 6 hours at each step. The CIE L*a*b* color index shows that, after heating at 600°C, the tint of blue in the samples was slightly faded. It increased in the reddish hue of the samples. Spectroscopic changes, particularly in FTIR spectra, reveal the shifted position of the peaks at 1980–2200 cm⁻¹ relative to the dehydration process of mineral inclusion. In addition, the change of a set of peaks at 3309, 3293, 3232, and 3185 cm⁻¹ of -OH stretching attributed to -OH stretching of molecular water, as well as the 6630–640 cm⁻¹ of O-Al-O bending, is an important indicator used to classify rubies treated at low temperatures.

Keywords: FTIR, Heat Treatment, Low-Temperature, Ruby

¹ Faculty of Gems, Burapha University, Chanthaburi Campus

* Corresponding author email: aumaparn.ph@go.buu.ac.th

Effects of water-to-cement ratio and curing time on the electrical output of cement-based triboelectric nanogenerator

Kanisorn Kaewsritthong¹, Anucha Kaewpoonsuk^{1,2}, Pincha Torkittikul³,
Chatdanai Boonruang^{4,5} and Thanongsak Nochaiya^{1,2,*}

A triboelectric nanogenerator is an energy-harvesting technology based on the conversion of mechanical energy from the environment to electricity through electrostatic induction. This research aims to study the effects of the water-to-cement ratio and curing time on the electrical output of cement-based triboelectric material (C-TENGs). Cement pastes with water-to-cement ratios of 0.3 and 0.4 by weight were prepared by hand mixing, cast in the mold, and then cured in a saturated solution of calcium hydroxide for 7 and 21 days. Afterward, the electrical outputs including voltage and current were investigated under the vertical contract-separation mode with a constant force at a frequency of 3 Hz. The studied results found that the electrical output decreased with increasing the water-to-cement ratios. Furthermore, the curing time increased, and lower electrical output of C-TENGs was also observed. Additionally, the triboelectric systems made by cement paste with a water-to-cement ratio of 0.3 by weight after being cured for 7 days showed the highest electrical output with a power density of 4.75 mW/m² for the external load resistance of 10 M-Ohm.

Keywords: Cement, Curing Time, Triboelectric Materials, Water-to-Cement Ratio

¹ Department of Physic, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Research Center for Academic Excellence in Applied Physics, Naresuan University, Phitsanulok, 65000

³ Department of Civil Technology, Faculty of Industrial Technology, Lampang Rajabhat University, Lampang, 52100

⁴ Department of Physics and Materials Science, Faculty of Science, Chiang Mai University, Chiang Mai, 50200

⁵ Center of Excellence in Materials Science and Technology, Chiang Mai University, Chiang Mai, 50200

* Corresponding author email: thanongsakno@nu.ac.th

Mechanical and physical properties of cellular lightweight concrete containing bottom ash

Thanongsak Nochaiya^{1,2,*}, Chanutta Jareanpon¹, Saowaluk Kamkum¹,
Panisara disuea¹ and Pincha Torkittikul³

Bottom ash is a by-product of the unburned coal from the combustion process of thermal power plants. This research aim is to study the properties of cellular lightweight concrete (CLC) blended with bottom ash (BA) compared to the TIS standards of 2601 – 2556. A foaming agent was used to produce CLC with the water-to-cement and the sand-to-cement ratios of 0.6:1 and 1:4, respectively while BA was used as a cementitious material up to 20 wt % of cement. The compressive strength, water absorption, and density of CLC concrete after curing at 7 and 28 days were investigated. The results showed that the density of CLC concrete containing BA presented in the range of 740-1,190 kg/m³. Moreover, the water absorption of CLC concrete increased when the volume of the foaming agent increased while BA affected to the water absorption of the CLC concrete. In addition, the 20%BA-CLC sample was found to have the highest strength of 2.00 kg/cm², which is the best condition for following the TIS 2601 – 2556 standard. However, the improvement of the cellular lightweight concrete mixture will also depend on the amount of additional foaming agents.

Keywords: Bottom Ash, Cellular Lightweight Concrete, Compressive Strength, Foaming Agents

¹ Department of Physics, Faculty of Science, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok, 65000

² Research center for Academic Excellence in Applied Physics, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok, 65000

³ Department of Civil Technology, Faculty of Industrial Technology, Lampang Rajabhat University, Lampang, 52100

* Corresponding author email: thanongsakno@nu.ac.th

Study on structural, dielectric, and energy storage properties of Ba²⁺ doped lead-free NaNbO₃-based ceramics

Pathit Premwicht¹ and Sasipohn Prasertpalichat^{1,2,*}

The energy storage properties of antiferroelectric (AFE) ceramics based on NaNbO₃ has gained widespread attention in recent years due to their promising applications in the energy storage devices. This study investigated the effect of barium (Ba²⁺) doping on the dielectric properties and energy storage properties of 0.88NaNbO₃-0.12Sr_{0.7}Bi_{0.2}TiO₃(0.88Na_{1-2x}Ba_xNbO₃-0.12Sr_{0.7}Bi_{0.2}TiO₃, at $x = 0.0-0.025$) ceramics prepared using a solid-state reaction method. The XRD data showed the phase transition from the orthorhombic structure to the pseudo-cubic structure at $x \geq 0.015$. The transition temperature of the antiferroelectric *P* phase to *R* phase increased markedly from 141°C for $x=0.0$ to ~160 °C for $x \geq 0.01$. Dielectric loss at room temperature ($\tan\delta_r$) at 1 kHz of the 100xBa ceramic was found to decrease significantly from 0.012 (for $x=0.0$) to 0.002 (for $x=0.025$) over the temperature range of 32°C to 130°C. With increasing Ba²⁺ doping content, the remnant polarization was greatly reduced, resulting in thin *P-E* hysteresis loop with increased energy storage density and efficiency. This leads to a maximum recoverable energy storage density of 0.28 J/cm³ and an energy storage efficiency of 76% for $x=0.015$ composition under an applied electric field of 125 kV/cm. The obtained results guide the design of NaNbO₃-based antiferroelectric materials to develop materials with improved energy storage performance.

Keywords: Dielectric Properties, Energy Storage Properties, Lead-Free Ceramics, NaNbO₃-Based Compound

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Research Center for Academic Excellent in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: sasipohnp@nu.ac.th

Physical properties and thermal properties of concrete mixed with crushed stone

Siwat Kamonkunanon¹, Pakorn Ket-in¹, Thanongsak Nochaiya^{2,3},
Panisara Disuea² and Phalitphat Khumfu^{1,*}

The objective of this research was to study the compressive strength, physical properties and thermal properties of concrete mixed with stone dust, waste materials from stone mills for applying in construction work. The 3/8 inches dust stone was used as a substitute for normal stone in the ratio of 0-100 percent by weigh. The concrete specimens, 150 x 150 x 150 mm were prepared and incubated in saturated calcium hydroxide solution for 7, 14 and 28 days. The density, water absorption, porosity, compressive strength, thermal conductivity and specific heat capacity were measured, the test results were found that when using rock dust instead of the rock in increasing amounts, the concrete mixed with rock dust had a slightly lower compressive strength than the controlled concrete. When replacing 100% of stone dust, it was similar compressive strength to control concrete. In addition, stone dust resulted in a decrease in the thermal conductivity of concrete and reduced heat transmission into the building.

Keywords: Compressive Strength, Concrete, Crushed Stone, Physical Properties, Thermal Conductivity

¹ Faculty of Industrial Technology, Uttaradit Rajabhat University, 27 Injaime Road, Tha-it, Maung, Uttaradit, 53000

² Department of Physics, Faculty of Science, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok, 65000

³ Research center for Academic Excellence in Applied Physics, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok 65000

* Corresponding author email: phalitphatk@gmail.com

X-ray shielding and mechanical properties of rubber compound/barium sulfate composite

Sutthisa Konruang^{1,*}, Thawatchai Tepnual¹, Pornpana Buaphet¹,
Suwit Pethauylung¹ and Narit Klompong²

X-ray shielding materials based on rubber compound (RC) and barium sulfate (BaSO_4) prepared with different concentrations ranging of BaSO_4 between 0-150 phr. The X-ray shielding properties of RC/ BaSO_4 composites were tested using a 60 kV X-ray generator at different material thicknesses (0.24-1.2 cm). Mechanical Properties of samples were investigated. The results showed that density increased with increasing BaSO_4 contents. However, hardness, tensile strength, elongation at break, and tear strength increased when BaSO_4 contents slight increased. The X-ray shielding parameters, namely the linear attenuation coefficient (μ_l), and mass attenuation coefficient (μ_m) of RC/ BaSO_4 composites increased with increasing BaSO_4 contents, while half-value layer (HVL) decreased. In addition, the X-ray attenuation rate increased with increasing of BaSO_4 contents and thicknesses, which the highest X-ray attenuation rate was 100 % in 100-150 phr BaSO_4 at 1 cm thickness.

Keywords: Barium Sulfate, Rubber Compound, X-ray Shielding Materials

¹ Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93210

² Department of General Education, Faculty of Science and Fisheries Technology, Rajamangala University of Technology Srivijaya, Trang, 92150

* Corresponding author email: Sutthisa@tsu.ac.th

Effect of firing temperatures on phase formation, microstructure, dielectric and magnetic properties of $\text{Ni}_{0.6}\text{Zn}_{0.4}\text{Fe}_2\text{O}_4$ ceramics synthesized by the solid-state combustion technique

Nutkamon Sonchaopri¹, Rattiphorn Sumang², Supree Pinitsoontorn³, Aurawan Rittidech⁴
and Theerachai Bongkarn^{1,5,*}

In this study, the effect of firing temperatures on phase formation, microstructure dielectric and magnetic properties of $\text{Ni}_{0.6}\text{Zn}_{0.4}\text{Fe}_2\text{O}_4$ (NZFO) ceramics were investigated. The NZFO powder were synthesized by the solid-state combustion technique using glycine as a fuel to reduce the reaction temperature. All samples were calcined in range of 900–1100 °C for 2 h and sintered in range of 1175–1275 °C for 2 h. A pure ferrite phase was found in the powders calcined above 1000 °C and the average particle size of NZFO powders was increased from 0.38 μm to 0.58 μm when the calcination temperature was increased. The x-ray diffraction (XRD) analysis results confirmed the formation of pure spinel structure with cubic phase in all the ceramic samples. Average grain size (5.54 to 2.80 μm) was slightly decreased, and the dielectric constant (239 to 13) tended to decrease with increasing sintering temperature. As the sintering temperature increased to 1250 °C, it was found that the lattice parameters (8.366 to 8.387), the density (5.29 to 5.35 g/cm^3), and saturation magnetization (81.51 to 93.92 emu/g) tended to increase after that decrease.

Keywords: Magnetic Properties, Microstructure, NZFO, Phase Structure, Solid-State Combustion Technique

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Program of Physics, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok, 65000

³ Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, 40002

⁴ Department of Physics, Faculty of Science, Mahasarakham University, Mahasarakham, 44150

⁵ Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: researchcmu@yahoo.com

Firing temperatures effect on phase formation, microstructure and electrical properties of BNBKL ceramics fabricated via the solid-state combustion technique

Metarsit Klinbanmor¹, Naratip Vittayakorn², Aurawan Rittidech³ and Theerachai Bongkarn^{1,4,*}

Lead-free $0.85\text{Bi}_{0.5}\text{Na}_{0.475}\text{Li}_{0.025}\text{TiO}_3-0.11\text{Bi}_{0.5}\text{K}_{0.5}\text{TiO}_3-0.04\text{BaTiO}_3$ (BNBKL) ceramics were prepared by the solid-state combustion technique. The BNBKL powders and ceramics were calcined and sintered between 650 to 850 °C for 1-5 h and 1100 to 1140 °C for 2 h, respectively. The effect of firing temperatures on phase structure, microstructure and electrical properties of BNBKL ceramics was investigated. X-ray diffraction pattern of BNBKL powders showed pure perovskite phase structure at calcination temperature of 800 °C for 3 h. The BNBKL ceramics sintered with different temperatures possessed a coexisting phase between rhombohedral (R) and tetragonal (T). The grain ceramics showed a polyhedral shape with directionless growth. The average grain size of BNBKL ceramics was increased from 0.80 to 1.26 μm when the sintering temperature increased from 1100 to 1140°C. The density of the BNBKL ceramics was increased as the sintered temperature increased up to 1120°C, after that it decreased. The highest density (6.05 g/cm^3) and dielectric constant (5855), were obtained by the sintering temperature of 1120 °C. As the sintering temperature increased, the polarization hysteresis loops (P-E loops) of BNBKL ceramics exhibited less saturation and more pinch indicating more relaxor behavior.

Keywords: BNBKL, Dielectric and Ferroelectric, Solid-State Combustion

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Advanced Materials Research Unit, School of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

³ Department of Physics, Faculty of Science, Mahasarakham University, Mahasarakham, 44150

⁴ Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: researchcmu@yahoo.com

Effect of firing temperatures on the phase formation, microstructure, and electrical properties of BCLTS ceramics

Widchaya Somsri¹, Naratip Vittayakorn² and Theerachai Bongkarn^{1,3,*}

$\text{Ba}_{0.94}\text{Ca}_{0.03}\text{La}_{0.03}\text{Ti}_{0.9}\text{Sn}_{0.1}\text{O}_3$ (BCLTS) lead-free ceramics were fabricated via the solid-state combustion technique, using glycine as fuel. The BCLTS samples were calcined and sintered in range of 1100-1200°C and 1350-1450°C for 2 h, respectively. A pure perovskite phase of BCLTS powders was found at the calcination temperatures above 1150°C. The BCLTS ceramics exhibited a perovskite structure with orthorhombic phase for all samples and secondary phase was observed at the sintering temperature above 1400°C. The average grain size tended to decrease with increase of sintering temperature. The dielectric constant at room temperature (ϵ_r) increased with the sintering temperature increased up to 1400°C and then decreased corresponding with the result of density. The best dielectric and ferroelectric properties were found at the sintering temperature of 1400°C.

Keywords: BCLTS, Combustion Technique, Dielectric, Ferroelectric

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Advanced Materials Research Unit, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10110

³ Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: researchcmu@yahoo.com

Effect of firing temperatures on phase structure, microstructure, electrical and magnetic properties of $(\text{Bi}_{0.5}\text{Na}_{0.5})_{0.7}\text{La}_{0.3}(\text{Ti}_{0.7}\text{Fe}_{0.3})\text{O}_3$ ceramics

Suphornphun Chootin^{1,2}, Anupong Luangpangai¹, Widchaya Somsri¹, Chanagon Menkun¹,
Naratip Vittayakorn³, Supree Pinitsoontorn⁴ and Theerachai Bongkarn^{1,2,*}

Lead-free $(\text{Bi}_{0.5}\text{Na}_{0.5})_{0.7}\text{La}_{0.3}(\text{Ti}_{0.7}\text{Fe}_{0.3})\text{O}_3$ (abbreviate as BNLTF) ceramics were prepared using the solid-state combustion method with glycine as fuel. The effect of sintering temperature (800-900°C for 2 h) on phase structure, microstructure, electrical and magnetic properties of BNLTF ceramic was investigated. The pure BNLTF powders were obtained at calcination temperature of 775°C for 2 h. XRD patterns exhibited a pure perovskite with coexistent phase between rhombohedral and tetragonal in all sintered ceramics. SEM was used to examine the morphology of BNLTF ceramics, the ceramic grains displayed polygonal shape and anisotropic growth. The remnant polarization (P_r) and coercive field (E_c) tend to decrease with sintering temperature increase. The highest remnant magnetization (M_r) of 0.0019 emu/gm was obtained by the sintering temperature of 875°C for 2 h.

Keywords: BNLTF, Ferroelectric, Magnetic Properties, Microstructure, Phase Structure

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

³ Advanced Material Research Unit, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

⁴ Institute of Nanomaterials Research and Innovation for Energy (IN-RIE), Khon Kaen University, Khon Kaen, 40002

* Corresponding author email: researchcmu@yahoo.com

Effect of firing temperatures on phase formation, microstructure, electrical, and energy storage properties of BNT-BT-BCTZ ceramics prepared via the solid-state combustion technique

Witsarut Chongsatan¹, Naratip Vittayakorn² and Theerachai Bongkarn^{1,3,*}

This study investigated the influence of firing temperature conditions on phase formation, microstructure, electrical, and energy storage properties of $0.25(0.94\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3-0.06\text{BaTiO}_3)-.75(\text{Ba}_{0.85}\text{Ca}_{0.15}\text{Ti}_{0.90}\text{Zr}_{0.10})\text{O}_3$ [BNT-BT-BCTZ] ceramics using the combustion technique. The BNT-BT and BCTZ powders were calcined at 800 °C for 2 h and 1150 °C for 4 h, respectively, and then the BNT-BT-BCTZ ceramics were sintered at 1100-1250 °C for 2h. The XRD analysis revealed that the ceramics exhibited coexistence of tetragonal ($P4mm$), tetragonal ($P4bm$), and rhombohedral ($R3c$) phases for all samples. The microstructure of BNT-BT-BCTZ ceramics using SEM exhibited quite polyhedral grain shape and the directionless growth. The average grain size, density, and dielectric constant at room temperature tend to increase when the sintering temperature increased. This study also reported on the energy storage properties of BNT-BT-BCTZ ceramics.

Keywords: BNT-BT-BCTZ Ceramic, Energy Storage, Microstructure, Phase Formation, Solid-State Combustion

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Advanced Material Research Unit, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

³ Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: researchcmu@yahoo.com

Enhancement of water resistance of cotton gauze by Ar- and He- cold plasma treatment

Nalinprapa Saranwong^{1,*}, Anuphong Suthatho¹, Kittiphol Rustanapong¹, Rittichai Boontarsai¹,
Kantarat Lekkaew² and Kanta Sangwijit³

Cotton gauze is a material that is commonly used for wound healing and wound care. The surface wettability of cotton gauze has a large effect on blood fluid absorption, protein absorption and blood cell adhesion. Therefore, the better water resistance of the cotton gauze will contribute to its better performance. The objective of this study is to use Argon (Ar) and Helium (He) cold plasma to improve the water resistance property of the gauze. The property "water resistance" was determined through Water Contact Angle (WCA). Several works agreed that a material with WCA of 40–70 degree was suitable for adhesion of various cells. The WCA of untreated gauzes could not be measured because it absorbed water immediately. To optimize the enhancement process, the plasma power of 85W, 95W and 105W, and gas flow rate at 2 L/min and 4 L/min were examined. The increase of gas flow rate for both types of gas decreased WCA of samples. As a function of time, the He-plasma treated gauze become more hydrophobic at 7 days with 44.10° of WCA (95W, 2 L/min). After that, the sample had significant reduction of the WCA. For the Ar-treated samples, the highest hydrophobicity could be observed at 24 hours with 65.29° of WCA (105W, 2 L/min). After that, there was a sharp decline of the property. In addition, the Ar-treated samples had more hydrophobic surface area compared with the He-treated one. In conclusion, this study leads to the method in improving a cotton gauze to have lesser blood and water loss as well as generate high humidity environment which is optimal for wound healing.

Keywords: Cold Plasma, Contact Angle, Cotton Gauze, Water Resistance

¹ Faculty of Engineering, Chiangrai College, Chiangrai, 57000

² Faculty of Oriental medicine, Chiangrai College, Chiangrai 57000

³ Plasma Bioengineering Unit, School of Science, University of Phayao, Phayao, 56000

* Corresponding author email: Nalinprapa.Saranwong@crc.ac.th

**The use of waste tire rubber as sand replacement in mortar:
effect on density, compressive strength and tensile strength of mortar**

Pincha Torkittikul^{1,*}, Thanongsak Nochaiya², Thachon Kaosomboon¹, Sarayut Malai¹,
Watthana Makararotrit¹, Apiwat Sripuman¹ and Warakhom Wongchai³

The aim of his research was to study the possibility of using waste tire rubber for producing construction materials. In this study, mortar was cast by using ground waste tire rubber passing through sieve size no.10 at 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100% by volume as natural sand replacement. The flowability of mortar was investigated and then cast in 5 cubic centimeters molds. The density, compressive strength, and tensile strength properties of mortars containing various amount of ground waste tire rubber were carried out. The results show that the density, compressive strength and tensile strength of mortars decreased with increasing the amount of using ground waste tire rubber as natural sand replacement. However, the mortar containing 100% ground waste tire rubber achieved compressive strength of 2.5 Megapascal or 25 kilogram per square centimeter which was greater than the standard specification for hollow non-load-bearing concrete masonry units.

Keywords: Compressive Strength, Density, Mortar, Sand Replacement Material, Waste Tire Rubber

¹ Civil Technology, Faculty of Industrial Technology, Lampang Rajabhat University

² Department of Physics, Faculty of Science, Naresuan University

³ Industrial Electrical Engineering, Faculty of Industrial Technology, Lampang Rajabhat University

* Corresponding author email: pincha_t@g.lpru.ac.th

Phase formation, microstructure and electric properties of La³⁺ substitution in B-site of lead-free BaTi_{0.91}Sn_{0.09}O₃ ceramics

Wiwat Pattanakasem¹, Nipaphat Charoenthai^{2,3}, Naratip Vittayakorn⁴, Nateeporn Thongyong⁵, Prasit Thongbai⁵ and Theerachai Bongkarn^{1,3,*}

This work investigated the effect of B-site La³⁺ substitution in BaTi_{0.91}Sn_{0.09}O₃ (BTS) systems on their phase structural, microstructure and electrical properties. The La³⁺ substituted BTS ceramics (Ba(Ti_{0.91}Sn_{0.09})_{1-x}La_xO₃; BTSL with x=0, 0.005, 0.010, 0.015 and 0.020) were fabricated by conventional solid-state reaction method. The powders and ceramics were calcined and sintered at the temperatures of 1200 °C for 2 h and 1400-1450 °C for 4 h, respectively. It was found that the BTSL ceramic with x=0 had pure perovskite structures with no detectable impurity. While, with x=0.005-0.020, BTSL ceramics exhibited perovskite structure accompanied with secondary impurity phases. The BTSL ceramics had presence of orthorhombic (O)+tetragonal (T) phases, O+T+ cubic (C) phases and only C phase when x =0-0.005, x=0.010-0.015 and x=0.020, respectively. Furthermore, Rietveld refinement revealed that the La³⁺ cation occupied in both of A-site and B-site when x≥0.005. The average grain size and the remnant polarization of BTSL ceramics exhibited slightly decrease when x increased from 0 to 0.005 and greatly decrease when x increased from 0.010 to 0.015. The Curie temperature (T_C) was 43 and 44 °C with x=0 and 0.005, respectively, and then greatly decreased as x increased to 0.020.

Keywords: Dielectric, Ferroelectric, Phase Formation, Rietveld Refinement

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

² Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok, 65000

³ Research Center for Academic Excellence in Applied Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

⁴ Advanced Materials Research Unit Department of Chemistry, School of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520

⁵ Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, 40002

* Corresponding author email: researchcmu@yahoo.com

Orbits of photon around the black hole with a light source

Nattawat Radjaroendee^{1,*}, Thammatorn Jamraschai¹ and Ekapong Hirunsirisawat¹

The behavior of photon around a black hole have been widely studied recently, where the phenomena has been limited to the photon from infinity without regard to the light source orbiting around black hole. This study focuses on numerical simulations and some theoretical analysis to characterize the photon emitted from a light source. Emitting angles causing interesting photon trajectories are analyzed and classified into three types, including 1) BetaRBK angle (β_{rbk}): the photon from this angle orbits around the black hole, and returns back to the light source. 2) BetaKBK angle (β_{kbk}): the photon from this angle escapes to infinity parallel to x-axis. 3) BetaCritical angle (β_{ph}): the photon coming from this angle enters a photon circular orbit. The escaped photons can be subclassified by looking at the lensed ratio by comparing the angle of escaped photons and the initial emitted angle to obtain the number of orbit rounds. This study reveals the characteristics of photons from a light source around a black hole and can be further used to analyze light behavior from compact stars or other glowing objects in more complicated systems.

Keywords: Numerical Simulation, Photons Trajectory, Point Light Source, Schwarzschild Black Hole

¹ Darunsikhalai Science School, King Mongkut's University of Technology, Thonburi, Bangkok, 10140

* Corresponding author email: maxma2548.maxma2005@gmail.com

Evolution of the background universe in DHOST theory with shift-symmetry

Wittaya Thipaksorn^{1,*}

We study the DHOST theory which satisfies gravitational wave constraints. We use autonomous system to analyze fixed points and their stabilities for DHOST theory with shift-symmetry. Cosmic evolutions are also considered. We found three categories of fixed points: scaling, kinetic, and de Sitter fixed points. We found that de Sitter and kinetic fixed points are always stable, while the scaling fixed point is saddle. Even though the kinetic dominated point is stable, this point can be reached under a specific initial conditions in which energy density of matter vanishes. We have shown that the universe can evolve from scaling fixed point which satisfies matter dominated epoch towards de Sitter fixed point corresponding to the accelerated expansion of the universe at late time.

Keywords: Cosmic Evolution, DHOST Theories, Modified Theories of Gravity

¹ Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93210

* Corresponding author email: wittaya@tsu.ac.th

Quantize fluxoid protection in an S-wave superconducting ring

Chatuporn Nisaisue^{1,*}

In our study, we investigate the phenomenon of critical temperature oscillations in superconducting rings under the influence of a magnetic field using the Gor'kov Green's function method. Our focus is on the crossover of the quantized fluxoid from the Aharonov-Bohm phase to the Little-Parks phase as the radius of the ring decreases relative to the Ginzburg-Landau coherent length. We analyze this phenomenon both in the large-radius limit and the finite-radius limit.

Keywords: Aharonov-Bohm Effect, Little-Parks Effect, Superconductor

¹ Department of Physics, Faculty of Science, Burapha University, Chonburi, 20130

* Corresponding author email: jatuporn.755138@gmail.com

Development of sugar adulteration detection in fruit juice using cavity-ringdown spectroscopy technique

Nichtima Uapoonphol^{1,*}, Sasiwimon Naksuriyawong², Kanokporn Boonsirichai¹,
Chakrit Saengkorakot¹, Jeelawat Esor², Ratchai Funklin² and Vorapot Permnamtip²

Adulteration of fruit juice products with cane sugar and corn syrup is a problem in many country. Some trading partners especially those in Europe have set quality criteria for adulteration to ensure safe consumption and to establish trade product standards. Carbon stable isotope analysis ($d^{13}C$) is often used as an adulteration index. The objectives of this research are developing the analysis of $^{13}C/^{12}C$ using the cavity-ringdown spectroscopy technique with laser isotope analyzer and making capable for detecting adulterated sugar in fruit juice. This research collected $d^{13}C$ data from fresh coconut water. A wide range of $d^{13}C$ was observed being from -27.67 ± 0.02 ‰ to -20.42 ± 0.05 ‰. The simulation of sugar addition in coconut water showed that adding sugar at 1% concentration resulted in a significant elevation in $d^{13}C$.

Keywords: Carbon Stable Isotope Analysis, Cavity-Ringdown Spectroscopy

¹ Nuclear Technology Research and Development Center, Thailand Institute of Nuclear Technology (Public Organization), Nakhon Nayok, 26120

² Nuclear Technology Service Center, Thailand Institute of Nuclear Technology (Public Organization), Nakhon Nayok, 26120

* Corresponding author email: nichtima@tint.or.th

Experimental study of heat capacity to minimize error in the first-year student physics laboratory

Songsak Saeyang¹, Sirikamon Saengmee-anupharb¹, Somrit Unai¹ and Sakda Koenrobket^{1,*}

This study aimed to determine the optimal conditions for the heat capacity of the experimental apparatus in order to minimize experimental error caused by heat exchange with the environment. The research was divided into two main sections: 1) an analysis of the calorimeter's temperature after thermal equilibrium was reached, and 2) an investigation of the relationship between specific heat capacity and the size of different masses of aluminum. The results demonstrated that several factors influenced the specific heat capacity of the calorimeter, including the time and temperature at which thermal equilibrium was achieved, the mass of the aluminum, and the surface area to volume ratio of the aluminum rod. The specific heat capacity of the aluminum exhibited the least experimental error within the first 10 minutes of the experiment and was approximately 900 J/kg·K.

Keywords: Calorimeter, Heat Capacity, Specific Heat

¹ Division of Physics, School of Science, University of Phayao, Phayao, 65000

* Corresponding author email: sakda.ko@up.ac.th

The free fall experiment using image processing techniques

Wasin tasroi¹, Rattanaporn Rueangrot¹ and Kriangsak Prompak^{1,*}

This work, free fall experiment using image processing techniques are presented. The research equipment consisted of a computer and a webcam. The program used in this experiment was written in Python and used the OpenCV library for image processing. The program detects the position of the orange ball held by the experimenter by way of color detection in HSV (which stands for Hue Saturation Value) mode. When the experimenter drops the ball past the starting position in the image, the program starts timing. After that, if the object passes through the stop position, the program will stop the timer and the detected time will be displayed on the screen. There are five distances traveled by an object from its starting position to its stopping position: 40, 50, 60, 70 and 80 cm. From the experimental results, it was found that distance and time squared had a linear relationship with equation $S=(1/2)gt^2$ and the acceleration due to gravity obtained from the calculations is close to the theory.

Keywords: Acceleration, Gravity, HSV, Image Processing, OpenCV, Python

¹ Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, 65000

* Corresponding author email: kriangsakp@nu.ac.th

Biogas technology transfer from livestock manure in Ban Nongban, Mueang Tak District, Tak Province

Yuttana Sriudom^{1,*}, Zinner Ratipat², Anurat Tewata¹, Chainarong Sanpao¹ and Wisit Khudsai¹

This project aimed to transfer technology about constructing and using biogas digester for Nongban villagers, Mueang Tak District, Tak Province. They were trained about constructing and applying the biogas digester for producing biogas from dung. Then, the biogas was used in household to replace LPG using. There were 23 trainees in this training. From the result of this project, it was found that the most trainers were farmers. Their highest educations were on primary or secondary school. Their incomes less than 10,000 baht/month. And the most of them 21 from 23 had never been trained about biogas producing technology. From the after training result of 5 level rating scale questionnaires, it was found that the result of trainer evaluation showed the highest scale of 4.6, S.D. = 0.656 for staffs or facilitators. The lowest scale of 4.35, S.D. = 0.714 for contents suitability. Moreover, all trainees could apply the knowledge from training. From post training evaluation, it was found that all 21 installed biogas digesters could produce biogas and replace LPG using about 390-400 baht/month/digester. For 21 digesters, they could save 8,190-8400 baht/month and their payback periods were 11 months.

Keywords: Biogas, Livestock Manure, Technology Transfer

¹ Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna Tak : 41/1 moo 7 Paholayothin road, Mai Ngam, Muang, Tak, 63000

² Business Management, Faculty of Business Administration and Liberal Arts, Rajamangala University of Technology Lanna Tak : 41/1 moo 7 Paholayothin road, Mai Ngam, Muang, Tak, 63000

* Corresponding author email: Yuttana.sriudom@gmail.com

Effects of drying air temperature and drying air velocity on drying kinetics pepper using fluidized bed technique

Jedsada Visedmanee^{1,*} and Sangkom Subphaso¹

The purposes of this research were to investigate the factors consisted of a temperature and Velocity of air flow affected se-lon pepper drying with fluidization technique. The fluidized bed dryer size of 20 cm diameter and 100 cm height was designed and constructed for this. The heater and blower size of 5kW, 1.25 kW was used for heating air at the static pressure of 1300 Pa. A cyclone size of 24 cm diameter and 122 cm height was used to separate the product from air. The galvanized steel pipe size of 4 inches diameter was used as air circulating pipe. The pepper size of 200 g was used for each experiment. The initial moisture in this experiment 25 % d.b. The drying temperature conditions were controlled at 80, 90 and 100 °C. The air velocity conditions in bed were controlled at 4, 6 and 8 m/s. The final moisture of corn was 12 % d.b.

From the result, it was found that the drying temperature was increased the also drying rate and specific moisture extraction rate trend to increase. The highest drying rate was 116.53×10^{-3} kgwater/h that was occurred at the 8 m/s air velocity and 100 °C drying temperature. The highest specific moisture extraction rate was 13.10×10^{-3} kgwater/kWh that was occurred at 6 m/s air velocity and 100 °C drying temperature.

Keywords: Fluidized Bed, Pepper, Temperature and Velocity

¹ Department of Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna TAK, 63000

* Corresponding author email: anh_tong2525@hotmail.com

Biomass briquettes from expired mushroom spawn with rice-straw

Tanapol Chimchour¹, Nalintip Tontan¹, Pantip Tue-Ngeun² and Kotcharat Phookung^{3,*}

The purpose of this research was to determine the optimum ratio of biomass pellets from used mushroom cube and rice straw. The used mushroom cube and the rice straw were crushed to a smaller size. Then, mixed together in the ratio of 1:1, 1:2, 1:3, 1:4 1:5, 2:1, 3:1, 4:1 and 5:1. The starch glue obtained by boiling cassava starch were used as a binder at a ratio of fuel mass to starch glue 1:2 (w/w) and compress it into fuel sticks. The properties of fuel sticks according to Thai Industrial Standards Institute (TIS) including density, moisture content, ash content, volatile compounds content, stable carbon value and calorific value were analyzed. The results showed that the best ratio of biomass pellets was 1:1 (example F1), with the density of 495.0427 kg/m³, the moisture content of 17.3913%, the ash content of 8.6667%, the volatile matter content of 73.9420% and the carbon constant of 73.9420%, which can be used as fuel.

Keywords: Biomass Briquettes, Expired Mushroom Spawn, Rice-Straw

¹ Department of Science, Branch of Physics, Faculty of Education, Uttaradit University

² Department of Chemistry, Faculty of Science and Technology, Uttaradit University

³ Department of Physics, Faculty of Education, Uttaradit University

* Corresponding author email: kotcharat@uru.ac.th

Drying herbs with vertical cylindrical solar incubator

Natsacha Inchoorun^{1,*}, Weerayuth Promjan¹, Rewadee Meesat¹, Sriwichai susuk¹,
Wanee Suttivattanavet¹, Kusol Iamsub² and Soravit Jamjumroon²

The vertical cylindrical solar incubator has a distinctive feature. The vertical cylindrical structure can receive sunlight in all directions and helps to distribute the heat inside the drying chamber evenly and thoroughly made with translucent material Polycarbonate. The upper part is equipped with a ventilator that helps suck moisture out of the system. The lower part is equipped with an air inlet to help fill new air into the system and then make the air circulate suitable for drying herbs such as rhizomes, leaves, and flowers such as ginger, galangal, turmeric, butterfly pea, roselle, pandanus, paniculata, etc. It can support fresh herbal raw materials up to 50 kg. and can control the temperature inside the drying room with Gate Valve. The test used samples of four herbs: ginger, turmeric, butterfly pea, and gotu kola. The drying conditions were determined as follows: drying temperature not higher than 60°C, final moisture content lower than 12% (wb), and aw value lower than 0.6, the results showed that ginger took the longest drying time, followed by namely, turmeric, gotu kola, and butterfly pea from the initial moisture content of 82.1, 86.4, 91.5, 85.6 % (wb), dried until the final moisture content of 8.8, 7.2, 9.1, 8.2 % (wb). The average temperature in the drying room was 45.5, 48.2, 49.8, 48.4 °C, drying time was 36, 27, 24, 15 h respectively.

Keywords: Drying Herbs, Vertical Cylindrical Solar Incubator

¹ Expert Center of Innovative Health Food, [innoFood], Research and Development Group for Bio-Industries, Thailand Institute of Scientific and Technological Research (TISTR), 12120

² Research and Development Group for Bio-Industries, Thailand Institute of Scientific and Technological Research (TISTR), 12120

* Corresponding author email: natascha@tistr.or.th

Poster Presentation

กลุ่มที่ 7 สาขาวิชาวิทยาศาสตร์นวัตกรรมเชิงพาณิชย์

Energy conservation induction motor for rice mill bucket 2.2 kW

Phairoach Chunkaew^{1,*}, Anurat Tevata¹, Aahirak Khadwilard¹, Sumroum Kosalanun²
and Chakkraphan Thawongamyingsakul¹

The purpose of this research is to conserve energy for 12 buckets with 2.2 kW induction motors of Tek Hua Huat 2 rice mill. Research methods, firstly, examining the operation principle and electrification are studied. Secondly, establishing a measure of conserving energy is designed. Thirdly, the measure is being used and is to measure the energy consumption. Finally, the saving effect is calculated. It was found that before implementing the measure of 12 buckets with 2.2 kW motors had consumed 57,996 kWh of electricity per year. After the preparation of the measure by using a 1-phase input power inverter and the output power of 3-phase power of a voltage of 220 V of 2.2 kW was used to control and to reduce the bucket speed at 35 Hz. The result of the electric energy measurement after adjustment was 29,891.8 kWh/y. The calculation of total saving was 29,891.8 kWh/y and the save electricity cost was 97,521.2 baht/y.

Keywords: Bucket, Energy Conservation, Rice Mill

¹ Department of Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna Tak

² Department of Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Thanyaburi

*Corresponding author, email: phairoac@rmutl.ac.th

Development of smart farming for organic crops management system

Phichaya Ratchaphon¹, Norawit Mahaprom¹ and Sarit Promthep^{2,*}

In Thailand, farming is a common occupation, but many farmers cannot afford technology to assist with crop cultivation. Additionally, people struggle to maintain their health due to busy schedules. Smart farming, facilitated by the Internet of Things (IoT), has the potential to address both issues. The authors developed a smart farming unit using NodeMCU ESP8266 microcontroller and sensors to control the watering, temperature, and environment of an organic garden. The unit can autonomously water plants and adjust temperature and light, and can be manually controlled through the Blynk application. The authors found that the unit effectively manages plant conditions without requiring excessive monitoring, making it a viable option for busy individuals who want to grow their own organic produce.

Keywords: Automation, Blynk, IoT, Organic, Smart Farm

¹ Demonstration School University of Phayao, University of Phayao, Phayao, 56000

² Department of Computer Science, School of Information and Communication Technology, University of Phayao, Phayao, 56000

*Corresponding author, email: Sarit.pr@up.ac.th

Application of thermoelectric in chicken egg incubator by controlled internet of thing

ChakkraphanThawonngamyingsakul^{1,*}, Phairoach Chunkaew¹, Aphirak Khadwilard¹ and
Kanyaphorn Chaiwong²

The objective of this research is to apply and determine an efficiency of incubator using thermoelectric plate with operating by internet of things (IoT). The incubator had the main components of a thermoelectric 12V 5A, an ultrasonic humidifier, IoT control system and an automatic egg turn system. The IoT control system could control and display the temperature and relative humidity. In addition, there is an online camera to look at the eggs inside the chicken eggs from a smartphone. Experimental condition, the temperature was to control at 37-37.5 °C with the relative humidity at 60-65% and turning automatic egg every 2 hours by using 10 eggs at a time. The temperature and relative humidity which were tested by the IoT system on the smartphone and references with Uni-T Ut333S thermometer and relative humidity meter found that the temperature error was 0.35%, the relative humidity error was 2.61%. From two experiments of 10 eggs, the first test used 19 days and had the birth rate 80%. The second test used 22 days and had the birth rate 90%.

Keywords: Chicken egg Incubator, IoT System, Smartphone Application, Thermoelectric

¹ Department of Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna Tak, Muang, Tak

² Bioenergy Technology Research Laboratory, Faculty of Engineering, Rajamangala University of Technology Lanna Nan, Phu Peang, Nan

*Corresponding author, email: chakkraphan@rmutl.ac.th

Determination of optimum parameters for drying banana slices using infrared radiation ceramic plates by response surface methodology

Aphirak Khadwilard^{1,*}, Phairoach Chunkaew¹, Chakkraphan Thawonngamyingsakul¹
and Niwat Pratoomchai¹

The purpose of this research was to study the optimum parameters that affect the specific energy consumption for drying banana slices using ceramic plate infrared heating with a response surface methodology. The variables studied were thickness of banana slices 3, 5 and 7 mm, distance of ceramic plate to banana slices 8, 12 and 16 cm and drying temperature of 50, 70 and 90°C. In the design of the experiment, the initial mass of the banana was 400 g and the initial moisture content was 220% d.b. The bananas were dried until the mass of bananas was less than or equal to 130 g or the moisture content was lower than or equal to 6% d.b. The results from the experiment showed that the factor level that caused the lowest specific energy consumption was banana slice thickness 3 mm, plate spacing 8 cm and drying temperature 90°C with lowest energy consumption at 8.41 MJ/kg. When analyzed by the response surface methodology and the model obtained, the optimum value of the lowest specific energy consumption was 7.7218 MJ/kg with 0.05 significance at a banana slice thickness variable of 3 mm, a heating coil distance of 8 cm and drying temperature 90°C, respectively.

Keywords: Infrared Radiation, Response Surface Methodology, Slice Banana, Specific Energy Consumption

¹ Department of Mechanical Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna Tak, Muang Tak, 63000, Thailand

*Corresponding author email: aphirak@mutl.ac.th

Efficiency of titanium dioxide and commercial coating on the inhibition of algal growth on concrete surface

Narudee Worasarn¹, Ailada Tipseerad¹, Watsaphon Tasoonthon¹ and Akeapot Srifa^{2,*}

Outdoor concrete walls and surfaces can be easily susceptible to algae, especially in hot and humid environments. These algae can induce biological deterioration and are a source of pathogens. Titanium dioxide has been reported to undergo a photocatalytic process and therefore help reduce the ability of algae to grow on the surfaces covered by this chemical. This study aims to compare the strength and to compare the algae inhibition efficacy of 5 cm standard mortar cube blocks coated with different ratio of titanium dioxide (1%, 5%, 10%, and 20%) after incubated with different algal inoculum (*Chlorococcum sp.*, *Nostoc paludosum*, and *Phormidium angustissimum*). Photos of the mortar surface were taken and analyzed its green hue saturation value for its mean intensity as an algal growth proxy. Generally, it was found that the algal showed slight decreases (approximately 10%) in all experimental groups after the inoculation, although different degrees of the decreases had been found according to algal species. This could be the adaptation of the algae in the lag phase of the growth or could be due to the nature of titanium dioxide or algal species.

Keywords: Anti Algae, Coating, Concrete, Titanium Dioxide

¹ Maharakham University Demonstration School (Secondary)

² Department of Biology, Faculty of Science, Maharakham University

*Corresponding author, email: akeapot.s@msu.ac.th

Navigation for mobile robots using millimeter-wave radar

Wisit Mangthas¹, Rattitikarn Boonpeaw^{1,2} and Waipot Ngamsaad^{1,*}

For mobile robots' automatic navigation, millimeter-wave (mmWave) radar sensors are of interest. The frequency-modulated continuous waves (FMCW) used by mmWave radar emit a series of electromagnetic waves between 60 and 64 GHz. The radar is different from conventional radar in that it has a higher frequency and a shorter wavelength. So that it can measure movements with a millimeter-level accuracy and be insensitive to sunlight. By examining the frequency and phase difference and employing a multiplier antenna, radar can calculate an object's velocity, angle to the target, and distance from it. The popular Kobuki robot with a millimeter-wave radar module (IWR1843BOOST) is used in this study as a model for mobile robot navigation. Our navigation program is based on SLAM (simultaneous localization and mapping), which is a component of the Robot Operating System (ROS). We investigate robot navigation under diverse circumstances. The test shows that mobile robots can operate with satisfactory precision using mmWave radar as a replacement for their existing navigation sensors.

Keywords: mmWave, Millimeter-wave radar, Mobile Robotics, Navigation

¹ School of Science, University of Phayao, Phayao, 56000

² School of Education, University of Phayao, Phayao, 56000

*Corresponding author email: waipot.ng@up.ac.th

Development of methodology for indicate efficiency of oxygen scavenger

Ratchaneewan Kulchan^{1,*} and Pattharaporn Reangpirom¹

Oxygen scavenger is classified as an active packaging, that absorb oxygen in packaging to prolong shelf life of products, especially its used more in food products. Nevertheless, oxygen scavenger would active immediately with oxygen in the air, so oxygen scavenger was put in the packaging that was vacuumed to prohibit its activity and had the indicator to present quality before being used. However, there was still no testing method for oxygen scavenger's efficiency. This research would present the methodology to test the efficiency of oxygen scavenger by doing 2 experiments. The first experiment would test the oxygen absorption efficiency of the oxygen scavenger using 50 ml oxygen scavenger sold in the market. The sample would use 1 oxygen scavenger sample which was put in the plastic box, then, in 17x25 cm Nylon/LLDPE bag, and sealed close. Later, these samples would be kept at 30 °C and experimented after being kept for 0, 2, 5,7,24,48 and 72 hours to measure oxygen by using oxygen analyzer to study the efficiency of oxygen absorption of the oxygen scavenger. The second experiment would do the comparing test using oxygen scavenger and comparing them between the scavenger that had 100% (Samples OS-100) and 50% (Samples OS-50) quality. One piece of 50 ml oxygen scavenger would be used compare with control sample that without oxygen scavenger, then, packed in plastic box with 100 g. of Luk Chup and later put in 17x25 cm Nylon/LLDPE bag, which these samples would be kept at 30 °C. The result of the oxygen absorption efficiency test found efficiency of oxygen scavenger, 100%, 95.24%, 87.03%, 78.82%, 69.46%, 10.34%, 0.99% and 0.99% after reaction in 0, 1, 3, 5, 7, 12, 24, 48 and 72 hours respectively. After using 100% and about 50% efficiency of oxygen scavenger with Luk Chup found that the oxygen scavenger in 100% quality was capable to decrease the mold spoilage compared with the samples using the oxygen scavenger in 50% quality and control that did not use oxygen scavenger.

Keywords: Active Packaging, Efficiency, Oxygen scavenger

¹ Thai Packaging Centre, Thai Institute of Scientific and Technological Research, 196 Phaholyothin Ladyao Chatuchack Bangkok, 10900

*Corresponding author email: ratchaneewan@tistr.or.th

Development of dyes for indicate freshness of seafoods

Ratchaneewan Kulchan^{1,*} and Pattharaporn Reangpirom¹

Seafood is a perishable product due to enzymes and microorganisms that contaminate the skin, such as fresh shrimp. When stored at room temperature, the bacteria found are *Micrococcus sp.* and *Staphylococci. cus sp.* *Staphylococci. cus sp.* can produce toxins. Food poisoning is big problems in Thailand. In this project, the objective is to develop smart packaging to indicate freshness of seafood to warn consumers against eating deteriorating food. Three types pH-dyes as Phenol red (PR code), Bromocresol Purple (BP code) and Phenolphthalein (Ph code) were developed to indicator pad. Its used to measure the deterioration of fresh shrimp and squid stored at 35 °C. The results showed that after storage for 5 hours, the indicator developed from Phenol Red had the most consistent color change with the deterioration of fresh shrimp (R2= 0.79). the color of indicator was changed from yellow to orange and red (TCD = 113.82) and fresh shrimp had total microbial content $\geq 10^6$ CFU/g, which was unacceptable for consumption. All three types of indicator were used to measure the deterioration of fresh squid in the same condition, it was found that the color of indicators developed from Bromocresol Purple was changed the most consistent with the deterioration of fresh squid (R2= 0.98), the color of indicator was changed from green to green-purple and dark purple (TCD = 196.15) and the microbial content was greater than 10^6 CFU/g after 20 hours of storage. The color of indicator that developed from phenolphthalein, was not changed both in shrimp and squid deterioration experiments. So Phenol Red indicator is the best used to measure the deterioration of fresh shrimp and Bromocresol Purple indicator is the best measured the deterioration of for fresh squid. There is a clear change in color and corresponds to the food's deterioration. However, indicators developed from phenolphthalein could not measure the deterioration of fresh shrimp and squid.

Keywords: Dyes, Freshness, Indicator, Seafood

¹ Thai Packaging Centre, Thai Institute of Scientific and Technological Research, 196 Phaholyothin Ladyao Chatuchack Bangkok, 10900

*Corresponding author email: ratchaneewan@tistr.or.th

“Botanical Bomb Innovation” phytocosmetic innovative product for hair care

Sakoolrud Raunmoon¹, Supakid Sachak¹, Waranya Thong-in¹, Boonyakorn Sonkhayan¹, Warintorn Bangwiset¹, Chatnutda Konwimon¹, Widsanusan Chartarrayawadee^{1,*}

Scalp hair plays an important role in social communication and social impacts in our daily life as it is one of the physical features to achieve the beauty of humans. Hair follicle defines hair shape which is a result from the organization of various structural protein elements. It can be assumed that large hair follicles can produce terminal hairs (mature type of human hair) while small follicles produce fine hairs (vellus). Hair follicles can be regressed by male hormone and turned terminal hairs in to vellus hairs recognizing as male pattern baldness or androgenetic alopecia (AGA). Greasiness from excess sebum on the scalp, pollution and aging of hair are also indirect causes that contribute to the degree of hair loss resulting from oxidative stress in hair follicle and follicular micro- inflammation. Phytonutrients in Asian traditional recipes are also recommended for use in hair loss treatment. The development of phytocosmetic formulation for commercialization as innovative product has been presented in this work as “Botanical Bomb Innovation” or “BB”. Our secret phytocosmetic innovative product is potentially increase hair follicle number, restore and enlarge hair follicles and induce anagen hair growth.

Keywords: Androgenetic Alopecia, Hair Follicle, Hair Loss, Phytocosmetic, Phytonutrient

¹ Division of Chemistry, School of Science, University of Phayao, Phayao 56000 Thailand

*Corresponding author email: widsanusan.ch@up.ac.th

An innovative safety holder of the endotracheal tube for neonates with severe respiratory illnesses

Nittalin Phunapai^{1,*}, Teerapath Limboonruang¹, Jantana Panburana², Sudaruch Rearkyai²,
Sittinun Tawkaew³ and Parkpoom Sriromreun¹

This research aims to design and develop an endotracheal tube safety holder innovation for newborns with severe respiratory symptoms that would be easy and efficient to use, meet standards, and be suitable for use in a real-life situation (at the fieldwork level). It will help reduce the restraining force of the weight of an endotracheal tube, the major cause of unplanned extubation in newborns, contributing to effectiveness in preventing or reducing unplanned extubation in newborns and reducing the risk of complications, including the mortality rate of newborns with respiratory problems. It shall be a model for developing domestic innovation without importing medical equipment and for reducing medical equipment imports from abroad, including by promoting and expanding opportunities to access efficient treatments in Thailand. The results showed that the newly developed endotracheal tube safety holder comprises three main parts: an endotracheal tube holder, a flexible tubing channel, and an equipment base. The endotracheal tube holder has two parts: a fixed endotracheal tube holder with a tightening adjuster to keep the endotracheal tube in place, and an adjustable endotracheal tube holder that can be moved to the right place. The advantage of this equipment is the flexibility of endotracheal tube mounting, and the equipment base is designed so that the tube is not exposed to the patient's head while it is being used.

Keywords: Critically Ill Infant, Endotracheal Tube, Neonates, Safety Holder

¹ Innovative Development, Automation System and Sustainability Laboratory (I-DASS Lab),

Department of mechanical engineering, Faculty of Engineering, Srinakharinwirot University, Ongkharak, Nakhornayok 26120

² Department of pediatrics, Faculty of Medicine, HRH Princess Maha Chakri Sirindhorn Medical Center,

Srinakharinwirot University, Ongkharak, Nakhornayok 26120

³ Department of chemical engineering, Faculty of Engineering, Srinakharinwirot University, Ongkharak, Nakhornayok 26120

*Corresponding author email: nittalin@g.swu.ac.th

Poster Presentation

กลุ่มที่ 8 Routine to Research

Adaptation of rice farmers in agriculture 4.0 era : case study of rice farmers in Pado Sub-district, Mayo District, Pattani Province

Suchanat Potikul^{1,*}, Nawawee Tohyeng¹ and Natthaphon Khiankhan¹

The objectives of this research were to study 1) the social and economic conditions of the farmers, 2) the level of social, economic adaptation and rice production, and 3) the relationship between demographic, economic, rice production and the level of social, economic and production adaptation. Data were collected using structured interviews by a sample of 120 farmer households using simple random sampling by means of drawing lots. The data were analyzed by using chi-square test. The research showed that the average age of the majority was 50.6. There was an average of 2 family members worked as the farmers. The average of holding areas of the households was 7.3 rai. The average income of the farmers was 11,025.2 baht per month. The rice seed mostly cultivated was Phatthalung, Zebu Kantang, Sangyod varieties, and Pattani bird claw, (67.5, 25.0, 5.5, 1.1 and 0.8 percent, respectively). The considerable reasons of cultivation of local rice varieties are good tasty, numerous harvestings, weather endurable, tall stems, long neck, simply harvest, less disease-pesticides, and high tillering, respectively. The analysis of the level of adaptation in rice farming was moderate ($\bar{x} = 3.36$), the economic adaptation was the highest ($\bar{x} = 3.46$). The household manages unnecessary expenses such as hanging out, excess electricity, and unplugged all electricity, etc. Followed by social adaptation ($\bar{x} = 3.41$) with adaptation such as consulting and exchanging ideas to solve farming problems with neighbors, communities or other groups, etc. Production adaptation ($\bar{x} = 3.21$) for example, creating diversity in farming production, cost reduction, etc. The results of the analysis of factors related to adaptation of farmers were statistically significant at the 0.01 level found that occupation and farming style were in relation to the adaptation of farmer.

Keywords: Adaptation, Agriculture 4.0, Rice farmer

¹ Pattani Community College, Pattani, 94000

*Corresponding author, email: phairoac@rmu.ac.th

ESPreL evaluation of chemical risk assessment in the Biochemical laboratory, School of Medical Sciences, University of Phayao

Piyawan Nuntaboon^{1,*}

This study aimed to survey and evaluate the chemical risk assessments in biochemical laboratories. The ESPReL Checklist, section 2, chemical management system was a tool for surveying and assessing risk, considering the probability and severity of incidents using the risk assessment criteria according to the biosafety guidelines of the Center for Occupational Safety, Health, and Workplace Environment Management (COSHEM), Mahidol University. This study found that there is no risk in handling the information on chemicals in the chemical management system of a biochemical laboratory. For the storage and transportation of chemicals in the laboratory, it showed a moderate risk assessment with moderate health effects that can be curable. This may be affected by repeated exposure or long-term exposure without being life threatening. This requires a strategy to prevent potential risk and the development of a risk plan in the next step.

Keywords: Chemical inventory, Degree of risk, ESPReL Checklist, Risk assessment

¹ School of Medical Sciences, University of Phayao, Phayao, 56000

*Corresponding author, email: npiyawan@yahoo.com

Morphology and meiotic chromosome behavior of oyster plant (*Tradescantia spathaceae* Sw.)

Konkanok Chaisen¹ and Wittaya Suwonnachot^{1,*}

The oyster plant or *Tradescantia spathacea* Sw. is one of the widespread ornamental plants. Hence, it was suitable to be employed in a study on the chromosomal behavior of meiosis for better understanding. This study aimed to find suitable conditions for studying chromosomes for effective learning in biology laboratories. The experiment consisted of recording morphology, suitable to collect samples, choosing a suitable time for effective cell digestion, and suitable time for staining, and using a microscope on cells. For morphology, it was an herbaceous plant with succulent stems and 20-60 cm tall. The leaves were single and arranged in a closed circular manner. The top was dark green. The bottom was purple-red. The flowers were white and it was a perfect flower. The formula was $\oplus K_3C_3A_6G_3$. The suitable time for sampling was in the morning at 9:00 a.m. The time for cell digestion was 5 min and the suitable time for staining was 10 min. The cell cycles included Interphase, Prophase I, Metaphase I, Anaphase I, Telophase I, Prophase II, Metaphase II, Anaphase II, and Telophase II. Diagrams in this study were used for both online and on-site learning. Suitable conditions were used to define the requirements of the procedure. They can also be used as information for taxonomic classification and advanced genomic characterization.

Keywords: Chromosomes, Meiosis

¹ Faculty of Interdisciplinary Studies, Khon Kaen University, Nong Khai Campus, Nong Khai, Thailand, 43000

*Corresponding author, email: witsuwon@kku.ac.th

Community innovation to increase the capacity for sustainable self-management on resource base in southern border provinces

Teppagone Pittayapinune¹ and Lateepah Domae^{1,*}

The purpose of this research was community potential development to create sustainable economic foundations. This research was a qualitative research. Data was collected by interviewing as well as formal and informal talking with the key Informants to be focus group. The researcher used method and collecting some information that were the knowledge of members of community and various group members in community. The results were found that 1) potential development for the community led to achieve a new learning process, to build stability of the community foundation economy, apply the sufficiency economy philosophy to reduce expenses, increase household income 2) developing the learning process skills of community members for mutual learning, which had established guidelines for local community development based on self-sufficiency principles based on sufficiency economy philosophy. 3) people in the community changed behavior in all aspects by learning from the empirical activities in various forms. There were ongoing workshops to develop the potential of the community 4) learning together in the community, bringing the community to learn together with other communities, communities in other areas to learn together in the development of community innovation to create economic security, recognizing and appreciating lifelong learning.

Keywords: Community Innovation, Local Economy, Sustainable Development Community

¹ Pattani Community college, Pattani

*Corresponding author, email: lateepah.dom@pncc.ac.th

Development of an undergraduate student admissions system, Faculty of Science, Mahasarakham University

Theerasak Thongyan^{1,*}

This research aims to: Study and analyze the problem of the old undergraduate student application system at the Faculty of Science, Mahasarakham University. Develop a system to recruit undergraduate students for the Faculty of Science, Mahasarakham University. Study the efficiency of the undergraduate student admissions system at the Faculty of Science, Mahasarakham University. The target group consists of 35 people, divided into 5 responsible officers and 30 system users. The research tool used was the undergraduate student application system, and the statistics employed were Mean and Standard Deviation. The results showed that: The problem with the old system is that it fails to meet the needs of both the staff and the applicants. The development of the undergraduate student application system at the Faculty of Science, Mahasarakham University, yielded two main components: a) Database System & Administration System: This component handles data management and system operation. b) User Interface: This component is used by system users and includes functions such as filling out information, deleting and editing information, and checking results through an identity verification process before accessing and modifying information. The study on the efficiency of the undergraduate student admissions system found that both the responsible staff group and system users considered the system to be appropriate at a good level overall and in each aspect.

Keywords: Online Application System

¹ Faculty of Science, Mahasarakham University

*Corresponding author email: theerasak.t@msu.ac.th

Development of young's modulus apparatus of metal wires for introduction physics laboratory class

Panisara Disuea^{1,*} and Thanongsak Nochaiya^{1,2}

This research study aims to design and develop a part of the experimental equipment set for determining Young's modulus of metal wires for introductory physics laboratory courses. Through the experiments, the new equipment set was invented under the condition of simple materials and is easy to move. The physical properties of the new experimental equipment set and the old one were evaluated. Both apparatuses were then compared to Young's modulus of metal wire from the Universal Testing Machine (Instron; series 5965). The comparison between experimental error and the cost of the new set and the old set was also evaluated. The results showed that the new experimental equipment set had a high accuracy with an error between 9.0 and 15.4% while the old apparatus showed an error higher than 15.3-24.7% compared to the standard machine. In addition, the invention cost of the new apparatus set was cheaper than that of the old one about 2.33 times per unit while it is easy to move and set up because of its lightweight.

Keywords: Physics Laboratory, Stress-Strain, Young's Modulus

¹ Department of Physics, Faculty of Science, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok 65000, Thailand

¹ Research center for Academic Excellence in Applied Physics, Naresuan University, 99 moo 9, Tha-Pho, Maung, Phitsanulok 65000, Thailand

*Corresponding author email: panisaradisuea@gmail.com

The development of QR code technology to support audiovisual work
School of Information and Communication Technology University of Phayao

Panuwat Lomakul^{1,*}

This quasi experimental research aimed to 1) study technology users' satisfaction towards QR Code which is developed and supported audiovisual education service and applying work manual information and Communication Technology, University of Phayao. This service is easier accessing usability equipment information in audiovisual education. Moreover, It is facilitation for users who can access information by oneself. It reduces the steps of work process for timesaving and resource reducing. The instruments used in the research were 1) a questionnaire to survey technology users' satisfaction towards using QR Code for supported audiovisual education. The stakeholder data collecting is from a number of samples reliability 95% deviation (e) +_5%. The sample group was selected by using Cresi and Morgan's random sampling. There are 71 people. The statistics used for data analysis was percentage, mean and standard deviation. The results show that: 1) The mean satisfaction is $\bar{x} = 4.22$, standard deviation S.D.= 0.53. It is the most satisfaction level. The general usability's mean is $\bar{x} = 4.23$, standard deviation S.D.=0.68. It is the most satisfaction level. The media estimation's mean is $\bar{x} = 4.21$, standard deviation S.D.= 0.68. It is the most satisfaction level. The proper of QR Code's mean is $\bar{x} = 4.12$, standard deviation S.D.= 0.68. It is more satisfaction level. The benefit's mean is $\bar{x} = 4.31$, standard deviation S.D.= 0.59. It is the most satisfaction level.

Keywords: Audiovisual aids, Information about audiovisual education, School of Information and Communication Technology, The Development of QR Code Technology to Support Audiovisual Work QR Code Technology

¹ School of Information and Communication Technology, University of Phayao

*Corresponding author email: Pnuwat.lo@up.ac.th

The development of laboratory equipment circulation system using storestock program in microbiology laboratory of school of medical sciences

Phannarai Pibalpakdee^{1,*} and Tosapon Somboon¹

The purposes of this research was to develop the Laboratory Equipment Circulation System in Microbiology Laboratory of School of Medical Science and to assess the overall satisfaction of users of the Microbiology's Laboratory Equipment Circulation System by using Storestock program which is develop from Microsoft Access. The tool used for data collection was a five-level estimate questionnaire. Data analysis and statistical methods used mean and standard deviation and survey from Faculty of Medical Science personnel and students studying Microbiology who were ever used the old system before. The results of the research showed that the new development of laboratory equipment circulation system using Storestock program in Microbiology Laboratory of School of Medical Science can used to develop the system very well from comparing the mean with Paired Sample t-test statistics. It was found that the new developed system is overall satisfied at 4.44, which is at a good level. Moreover, it was found that the hypothesis was user satisfaction of the development of laboratory equipment circulation system using Storestock program in Microbiology Laboratory of School of Medical Science after renovation more effective than before the update at a significance level 0.05. From the research results, it can be concluded that the renovated development of laboratory equipment circulation system using Storestock program in Microbiology Laboratory of School of Medical Science can help to saving time and cost reduction, allows faster and more efficient management of laboratory equipment circulation system.

Keywords: Circulation System, Laboratory Equipment, Storestock Program

¹ Division of Microbiology and Parasitology, School of Medical Science, University of Phayao, 56000

*Corresponding author email: pibalpakdee_ph@hotmail.com

Sponsored by





SCIENCE
RESEARCH 14th
CONFERENCE



SCHOOL OF SCIENCE UNIVERSITY OF PHAYAO
19 Moo 2 Tambon Maeka Amphur Muang Phayao 56000 Thailand