International Conference on Bioscience and Biorefinery 2021

Book of Abstracts

IC2B

Valorization of Bioresources to Create a Sustainable World

13-14 October 2021

Organized by:

Seratus Satu Tahun Institut Teknologi Bandung

Institut Teknologi Bandung 1920

PUI-PT nutrasetikal

PUSAT PENELITIAN BIOSAINS & BIOTEKNOLOGI INSTITUT TEKNOLOGI BANDUNG

SITH Sekolah Ilmu dan Teknologi Hayati

WELCOMING REMARKS

On behalf of the Organizing Committee, I am very much honoured and delighted to welcome all honourable speakers and participants to the 1st International Conference of Bioscience and Biorefinery (IC2B) organized by Bioscience and Biotechnology Research Centre, ITB supported by School of Life Sciences and Technology, ITB and co-supported by International Islamic University Malaysia and University of Malaysia Terengganu. It is wonderful to have more than 300 speakers and participants from various universities, research institutes, government agencies and industries from Indonesia, Malaysia, Taiwan, Korea, Japan, Australia, The Netherlands, Switzerland, United Kingdom and United State of America.

We would like to express our sincere gratitude to all honourable keynote and plenary speakers who will share their vast knowledge and experience of frontiers research and recent developments in the field of agriculture, food and post-harvest technology, biodiversity and forestry, bioenergy, bioengineering and chemical engineering, bioinformatics and technology 4.0, biomaterial, biomedical science and engineering, biotechnology, nanotechnology, nutraceuticals and natural materials.

We are very grateful to the Steering Committee for great supports that allow the Organizing Committee to develop an engaging conference that feature keynote sessions, plenary sessions, parallel sessions, and creative poster sessions. We are also very thankful to the Scientific Committee wo have helped a lot to review all the abstracts, full papers and creative posters. Our special appreciation to all moderators for their valuable contribution to chair all the sessions in this conference. We are also very much thankful to Institute of Research and Community Service of ITB, PT BUCHI Indonesia and PT Elo Karsa Utama for their generous supports to sponsor this conference. Last but not least, out utmost and sincere gratitude to all the participants that make this conference memorable.

Although this conference has to be carried out virtually due to the Covid-19 pandemic, we hope that the participants will be dazzled by all presentations and creative posters. We also hope that all of us can have stimulating and engaging discussions as well as creating new networks for future collaboration. Let’s valorise to create a sustainable world.

Chairperson, IC2B 2021

Assoc. Prof. Dr. Muhammad Yusuf Abduh

WELCOMING REMARKS

Dear Distinguished speakers, participants, and guest

Ladies and Gentlemen,

It is our great pleasure to welcome you in the international conferences of bioscience and biorefinery (IC2B) which is organized by University Center of Excellence Nutraceutical, (PUI-PT Nutraceutical) Bioscience and Biotechnology Research Center (BBRC) Bandung Institute of Technology (ITB), Indonesia. We, in the BBRC are glad to host IC2B after successfully organized The Bandung International Conferences on Food and Health (BICFH 2019) attended by many scientists from around the word. In the IC2B, many prominent researchers from several countries in the field of bioscience, biorefinery and the related knowledges also join. Due to the pandemic covid-19, this year we are not able to host the conference offline. I believe this IC2B online conference will give speakers and participant great opportunities to share the knowledge and expertise as well as research experiences in related fields. In addition, this conference will strengthen collaboration network in bioscience and biorefinery research among participants.

Fast development of sciences and technology has provided good challenges to utilize natural sources for human welfare such as food, nutraceutical, medicine, and other health related products. Sophisticated and good quality of research have contributed to improve the quality of natural based products that could be continuously improve the quality of life. In this conference, we will learn from the speakers about the research finding and discovery.

PUI-PT Nutraceutical is one of University Centers of Excellence in Indonesia that would like to contribute to development of sciences in technology as well as the natural base products. The center has conducted researches; share knowledge and technology through conference, seminar, workshop, training; human research development, continuously learn from many other institutions, initiate and strengthen collaboration and other activities. Several scientists, researchers and students have been involving in the center. I do would like to invite the IC2B participants too.

IC2B has well prepared by the committee, I would like to thank all committee members and other contribution from partner institutions. Your contribution from beginning to arrange the conference is much appreciated. I believe all effort from the committee will makes the conferences extremely important.

I sincerely wish the IC2B 2021 will bring all participants to great scientific moment with fruitful discussion during the talks in keynote, parallel, invited, oral and poster session. We

do hope that the conference will be successful and your participation and contribution in the conference memorable and productive.

Sincerely yours,

Head of University Center of Excellence, Nutraceutical, Bioscience and Biotechnology Research Center, Bandung Institute of Technology

Vice Dean of Academic Affair, The School of Pharmacy, Bandung Institute of Technology

Dr. apt. Elfahmi, M.Si

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PROGRAM SCHEDULE

Day 1, Wednesday, 13 October 2021

Time (GMT+7)	Event	Speaker
08.00 - 08.30	Registration	
08.30 - 08.40	Opening	Host
08.40 - 08.50	Welcoming remarks by Chief Organizer	Dr. Muhammad Yusuf Abduh
08.50 - 09.00	Welcoming remarks by The Head of Bioscience and Biotechnology Research Center (BBRC), ITB	Ir. Sri Harjati Suhardi, Ph.D
09.00 - 09.30	Keynote Speech 1	Prof. Ir. Nizam, M.Sc., DIC, Ph.D., IPU, Asean Eng - Director General of Higher Education, Research, and Technology
09.30 - 10.00	Keynote Speech 2	Dr. Ir. Fadjry Djufry, M.Si - Head of Agricultural Research and Development Agency
10.00 - 10.25	Panel Discussion	Moderator: Dr. Ahmad Faizal
10.25 - 10.50	Plenary Speech 1	Prof. Dr. Robert Manurung (Indonesia)
10.50 - 11.15	Plenary Speech 2	Prof. Gil Garnier (Australia)
11.15 - 11.40	Plenary Speech 3	Prof. Dr, Ir. Hero Jan Heeres (Netherland)
11.40 - 12.05	Panel Discussion	Moderator: Dr. M. Yusuf Abduh
12.05 - 13.00	Break (Poster Exhibition)	
13.00 - 13.20	Plenary Speech 4	Prof. Hak Lae Lee (South Korea)
13.20 - 13.40	Plenary Speech 5	Prof. Wilhelm Gruissem (Switzerland)
13.40 - 14.00	Panel Discussion	Moderator: Dr. Ima Mulyama Z
14.00 - 16.00	Parallel Session	Oral Presenter
16.00 - 16.15	Closing	Host

Day 2, Thursday, 14 October 2021

Time (GMT+7)	Event	Speaker
08.20 - 08.35	Registration	
08.35 - 08.40	Opening	Host
08.40 - 08.50	Welcoming remarks by The Head of Science and Technology Center of Excellence	Dr. apt. Elfahmi
08.50 - 09.00	Welcoming remarks by Dean of School of Life Sciences and Technology	Dr. Endah Sulistyawati
09.00 - 09.30	Keynote Speech 3	Ir. Budi Gunadi Sadikin, CHFC, CLU - Minister of Health Affair Indonesia
09.30 - 10.00	Keynote Speech 4	Adriansjah Azhari, M.M. - Senior Executive Vice President R&D, PT. Biofarma
10.00 - 10.25	Panel Discussion	Moderator: Dr. Agus Dana P
10.25 - 10.50	Plenary Speech 6	Prof. Yoshiharu Matsuura (Japan)
10.50 - 11.15	Plenary Speech 7	Dr. Ernawati Giri Rachman (Indonesia)
11.15 - 11.40	Plenary Speech 8	Dr. Husna Nugrahapraja (Indonesia)
11.40 - 12.05	Panel Discussion	Moderator: Dr. Marselina Tan
12.05 - 13.00	Break (Poster Exhibition)	
13.00 - 13.20	Plenary Speech 9	Prof. Dr. Azura Amid, (Malaysia)
13.20 - 13.40	Plenary Speech 10	Prof. Chin Kun Wang (Taiwan)
13.40 - 14.00	Panel Discussion	Moderator: Dr. apt. Elfahmi
14.00 - 16.00	Parallel Session	Oral Presenter
16.00 - 16.15	Announcement and Closing	Host

KEYNOTE SPEECH

Day 1, Wednesday, 13 October 2021

Time (GMT+7)	Moderator	Event	Speaker	Topic
09.00 - 09.30	Dr. Ahmad Faizal	Keynote Speech 1	Prof. Ir. Nizam, M.Sc., DIC, Ph.D., IPU, Asean Eng (Director General of Higher Education, Research, and Technology)	Strategies for research and technology development to produce high value bioproducts for the development of a circular economy in Indonesia
09.30 - 10.00		Keynote Speech 2	Dr. Ir. Fadjry Djufry, M.Si (Head of Agricultural Research and Development Agency)	Application of smart agricultural technology and innovation in the development of an integrated and sustainable agricultural sector
10.00 - 10.25		Panel Discussion		

Day 2, Thursday, 14 October 2021

Time (GMT+7)	Moderator	Event	Speaker	Topic
09.00 - 09.30	Dr. Agus Dana P.	Keynote Speech 3	Ir. Budi Gunadi Sadikin, CHFC, CLU (Minister of Health Affair Indonesia)	Collaboration between government, universities and industries to develop health technologies that can improve the quality of lives
09.30 - 10.00		Keynote Speech 4	Adriansjah Azhari, M.M. (Senior Executive Vice President R&D, PT. Biofarma)	Synergy between industries and universities in the development of an integrated and sustainable pharmaceutical sector
10.00 - 10.25		Panel Discussion		

PLENARY SPEECH

Day 1, Wednesday, 13 October 2021

Time (GMT+7)	Moderator	Event	Speaker	Topic
10.25 - 10.50	Dr. M. Yusuf Abduh	Plenary Speech 1	Prof. Dr. Robert Manurung (Institut Teknologi Bandung, Indonesia)	Valorization of Indonesian bioresources towards industrial symbiosis and circular bioeconomy
10.50 - 11.15		Plenary Speech 2	Prof. Gil Garnier (Monash University, Australia)	BioProducts, here, there, everywhere!
11.15 - 11.40		Plenary Speech 3	Prof. Dr, Ir. Hero Jan Heeres (University of Groningen, The Netherlands)	Valorization of biomass to produce biofuels and platform chemicals using the biorefinery concept
11.40 - 12.05		Panel Discussion		
13.00 - 13.20	Dr. Ima Mulyama Z	Plenary Speech 4	Prof. Hak Lae Lee (Seoul National University, Republic of Korea)	Nanocelluloses: New bioresource materials for future society
13.20 - 13.40		Plenary Speech 5	Prof. Wilhelm Gruissem (ETH Zurich, Switzerland and and NCHU, Taiwan)	Improving nutritional qualities of rice and cassava for human health and industrial applications
13.40 - 14.00		Panel discussion		

Day 2, Thursday, 14 October 2021

Time (GMT+7)	Moderator	Event	Speaker	Topic Description
10.25 - 10.50	Dr. rer nat Marselina Tan	Plenary Speech 6	Prof. Yoshiharu Matsuura (Osaka University, Japan)	Challenges and opportunities in the development of Covid-19 vaccine
10.50 - 11.15		Plenary Speech 7	Dr. Ernawati Giri Rachman (Institut Teknologi Bandung, Indonesia)	The development of Indonesian local COVID-19 vaccine in ITB
11.15 - 11.40		Plenary Speech 8	Dr. Husna Nugrahapraja (Institut Teknologi Bandung, Indonesia)	Reverse Vaccinology: A bioinformatics approach to accelerate the biomedical research
11.40 - 12.05		Panel Discussion		
13.00 - 13.20	Dr. Elfahmi	Plenary Speech 9	Prof. Dr. Azura Amid (International Islamic University Malaysia, Malaysia)	Development of high value natural products from tropical plants
13.20 - 13.40		Plenary Speech 10	Prof. Chin Kun Wang (Chung Sang Medical School, Taiwan)	Natural based nutraceuticals for improving human health
13.40 - 14.00		Panel discussion		

PARALLEL SESSIONS

Day 1, Wednesday, 13 October 2021

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
1	71	14.00 - 14.15	Production of propolis and honey by *Tetragonula laeviceps*	Muhammad Yusuf Abduh, Annisa Shabrina, Andreas Raden Caman, Arsy Elia Pertiwi and Muhammad Insanu
	33	14.15 - 14.30	Effects of pH, dosage and contact time on phenol removal using baobab fruit shell activated carbon	Radhia Nedjai, Nasserdeen Ahmed Kabbashi, Md Zahangir Alam and Ma'an Fahmi Rashid Alkhatib
	45	14.30 - 14.45	Optimization of culture medium for bacteria cellulose production using *Komagataeibacter intermedius*	Katherine Kho, Putu Virgina Partha Devanti, Ferren Pratama, Mohammad J Taherzadeh and Solmaz Aslanzadeh
	29	14.45 - 15.00	Rhizomicrobiome engineering using the halotolerant N-Fixer-PGPR inoculant for increasing the N-fixers biodiversity, N-update and rice agronomic traits on saline soils	Tualar Simarmata, Toto Bustomi, Fiqriah Khumairah, Betty N Fitriatin and Mieke R Setiawati
	62	15.00 - 15.15	In vitro callus induction of *Plukenetia volubilis* (Sacha Inchi), a PUFA-Rich plant	Jasrina Mohd Jalil, Widya Abdul Wahab and Tamil Chelvan Meenakshi Sundram
	49	15.15 - 15.30	Hydrolytic enzyme producing bacteria from the gut of *Oryctes rhinoceros* larvae inhabiting household waste composter	Ni'Matuzahroh Ni'Matuzahroh, Moch. Affandi, Fatimah Fatimah, Ana Mariatul Khiftiyah, Silvia Kurnia Sari, Miftahul Jannah, Nastiti Trikurniadewi, Achmad Zainal Abidin, Nurul Wahyuni and Rizki Amaliah Zain
	47	15.30 - 15.45	Kinetic model of phytochemical compounds extraction from *Orthosiphon aristatus* using hydrothermal method	Nadya Rizkita, Daniel Jananto, Ferrel Hamonangan, Siti Machmudah, Sugeng Winardi, Wahyudiono and Motonobu Goto

	13	15.45 - 16.00	Nonthermal plasma over an aqueous solution surface for lignin valorization at atmospheric pressure	Wahyu Diono, Machmudah Siti, Hideki Kanda, Yaping Zhao and Motonobu Goto

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
2	14	14.00 - 14.15	Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a reflux extraction method	Albert Setiawan, Ima Mulyama Zainuddin and Muhammad Yusuf Abduh
	16	14.15 - 14.30	Production of cellulase enzyme by solid state fermentation of groundnut shell (*Arachis hypogea*) Using *Trichoderma* sp. and Tempeh yeast	Sitti Dhiffah Nabilah Abdul, Muhammad Yusuf Abduh and Khairul Hadi Burhan
	17	14.30 - 14.45	Cellulase production by solid state fermentation of groundnut shell (*Arachis hypogaea*) waste by *Trichoderma* sp.	Alfanny Putri Fadhlilah, Khairul Hadi Burhan and Muhammad Yusuf Abduh
	2	14.45 - 15.00	Pectin extraction optimization using closed vessel microwave assisted extraction to synthesize amidated pectin polymeric surfactant of Pacitan Sweet Orange Peel (*Citrus sinensis* L. Osbeck cv. Pacitan)	Widya Dwi Rukmi Putri, Margaretha Hanna Tiffani, Aditya Wardana, Nisa Alfilasari, Elok Zubaidah and Kiki Fibrianto
	19	15.00 - 15.15	Lignocellulose degradation of cinnamon bark (*Cinnamomum burmannii*) by *Aspergillus awamori* to increase cinnamon oil yield	Dennis Avima, Abednego Kurio Widianto, Ravelian Yulianto, Rika Alfianny and Muhammad Yusuf Abduh
	22	15.15 - 15.30	Cellulase production by fungal mixed culture in solid state fermentation of groundnut shell (*Arachis hypogaea*) waste	Chalil Rizqullah Ramadhan, Khairul Hadi Burhan and Muhammad Yusuf Abduh
	24	15.30 - 15.45	Isolation of essential oil from *Zingiber officinale* through hydrodistillation and pre-treatment with *Aspergillus niger*	Izzatunnisaa, Khalilan Lambangsari and Muhammad Yusuf Abduh
	28	15.45 - 16.00	Isolation of essential oil from *Zingiber officinale* through steam distillation and pre-treatment with *Aspergillus niger*	Raihannisa Rizqi Meutia, Khalilan Lambangsari and Muhammad Yusuf Abduh

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
3	3	14.00 - 14.15	Enhancement of turmeric oil extraction by solid-state rhizome fermentation using *Aspergillus* sp.	Yohanes Theda, Asri Ifani Rahmawati, Tinta Komariyah and Muhammad Yusuf Abduh
	37	14.15 - 14.30	Pre-treatment of spearmint leaves (*Mentha spicata* L.) with *Aspergillus awamori* to increase essential oil yield	Tjokorda Istri Indira, Mochamad Firmansyah, Agus Dana Permana, Robert Manurung, Ula Aulia Fitrian and Muhammad Yusuf Abduh
	41	14.30 - 14.45	Optimization of maceration conditions for ethanolic extract of *Moringa oleifera* leaves applying Box-Behnken design of experiment	Dyah Nurasri Darmastuti Purboyo, Mochamad Firmansyah, Lili Melani, Marselina Irasonia Tan, Anggraini Barlian, Popi Septiani, Husna Nugrahapraja, Nayla Majeda Alfarafisa and Ahmad Faizal
	42	14.45 - 15.00	Recovery of ammonium nitrogen from urea fertilizer plant wastewater using struvite crystallization stirred tank reactor modification	Raudhatul Ulfa, Izarul Machdar, Suhendrayatna Suhendrayatna and Yunardi Yunardi
	12	15.00 - 15.15	Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a maceration method	Fahmi Ramdhani, Ima Mulyama Zainuddin and Muhammad Yusuf Abduh
	11	15.15 - 15.30	Isolation of essential oil from *Zingiber officinale* through maceration and pre-treatment with *Aspergillus niger*	Adrian Sinaga, Khalilan Lambangsari and Muhammad Abduh
	58	15.30 - 15.45	Lipid content and morphology of *Skeletonema costatum* on nutrient N and Si stress	Tutik Nurhidayati, Wahyu Osi Diana Putri, Hery Purnobasuki, Wirdatul Muslihatin and Kristanti Indah Purwani
	59	15.45 - 16.00	Cultivation of black soldier fly larvae to produce fishmeal and fertilizer	Rian Fiqraini, Kelvin Alfianza, Yasriza Nanda, Rijanti Rahaju Maulani and Muhammad Yusuf Abduh

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
4	60	14.00 - 14.15	Integrated cultivation of tomato with *Tetragonula laeviceps*	Tjokorda Istri Indira, Robert Manurung, Rijanti Rahaju Maulani, Aep Supriyadi, Khairul Hadi Burhan, Mochamad Firmansyah, Diah Nofitasari and Muhammad Yusuf Abduh
	25	14.15 - 14.30	Enrichment of growing media using biochar, compost, and nano-silica for the cultivation of *Oryza sativa* L. at Sumedang, Indonesia	Elizabeth Widiasri, Diah Nofitasari, Rijanti Rahaju Maulani, Khalilan Lambangsari, Robert Manurung and Muhammad Yusuf Abduh
	90	14.30 - 14.45	Phytoremediation of chromium using napier grass (*Pennisetum purpureum*) in horizontal subsurface flow constructed wetland	Taufik Taufikurahman, Lili Melani, Natasha Lumongga Hugo Sianturi, Ni Komang Devi Amrita Wirawan and Aisyah Fairuz Saifullah
	91	14.45 - 15.00	A comparison on growth of *Spirulina platensis* and Nannochloropsis sp. in mixed culture and monoculture using aquaculture wastewater as growth medium	Fathan Assabiqi, Isna Annisa, Muhammad Prawira, Taufik Taufikurahman and Lili Melani
	73	15.00 - 15.15	Effect of drying on the yield of essential oil extracted from the peel of Rimau Gerga Lebong	Rian Fiqraini, Khalilan Lambangsari and Muhammad Yusuf Abduh
	74	15.15 - 15.30	Drying of vanilla (*Vanilla planifolia* Andrews) in a simple drying system with incandescent light treatment and air circulation	Isti Kamahsari, Agus Dana Permana and Khalilan Lambangsari
	9	15.30 - 15.45	Development of modular cage for controlled cultivation of black soldier fly	Tjokorda Isteri Indira, Robert Manurung, Agus Dana Permana and Muhammad Yusuf Abduh
	18	15.45 - 16.00	Valorization of lower grade resin, bark, and fruit of *Styrax sumatrana*	Muhammad Yusuf Abduh, Ananda Teli Rahmanita, Elga Ridho Maulana, Valenikhe Fitri Nadhira, Tjokorda Isteri Indira and Robert Manurung

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
5	94	14.00 - 14.15	Liquid-liquid equilibrium for eugenol + asetic acid + water systems at 303.15 K and atmospheric pressure	Retno Kumala Hesti Sucipto, Kuswandi Kuswandi and Gede Wibawa
	75	14.15 - 14.30	Drying vanilla (*Vanila planifolia* Andrews) using infrared heat and air circulation	Puji Rahayu, Khalilan Lambangsari and Agus Dana Permana
	76	14.30 - 14.45	Measurement of isobaric vapor-liquid equilibrium, data correlation and prediction for methanol - glycerol system at 61.3 and 100.8 kPa	Rizky Tetrisyanda, Moh. Arif Batutah, Kuswandi and Gede Wibawa
	79	14.45 - 15.00	Mitragynine: A review of its extraction, identification, and purification methods	Amrianto Amrianto, Sumail Sidik Ode Ishak, Nanda Putra, Syefira Salsabila and Laode M.R. Al Muqarrabun
	95	15.00 - 15.15	Assessment phytochemical profile as indicator of oil palm plants with stem rots caused by *Ganoderma boninense* in Peatlands	Ellia Septiarahma Rumambi, Jones P. Silitonga, Ulfa Salsabila and Cico Jhon Karunia Simamora
	97	15.15 - 15.30	Valorization of empty palm bunch waste (*Elaeis guineensis*) into lyocell fibre using environmentally friendly solvent N-Methylmorpholine N-Oxide (NMMO)	Febrita Siregar, Imelda Magdalena and Kevin Manurung
	72	15.30 - 15.45	A review on stingless bees as pollinators for agricultural crops	Muhamad Aldi Nurdiansyah, Agus Dana Permana and Muhammad Yusuf Abduh
	70	15.45 - 16.00	The effect of coffee skin waste (*Coffea* sp.) with ammoniation process as alternative feed mixture on growth, feed conversion, and meat quality of Cobb broiler chicken	Abdul Halim, Muh Dimas Erdo Kusuma, Asep Hidayat and Yeyet Setiawat

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
6	68	14.00 - 14.15	The effect of endophytic Bacteria *Bacillus amyloliquefaciens* and *Bacillus subtilis* on changes the composition of sugar post-harvest of Cilembu Sweet Potato (*Ipomoea batatas* L. var. cilembu)	Agustina M. Tangapo, Dea I. Astuti and Pingkan Aditiawati
	61	14.15 - 14.30	Red kidney bean as soybean alternative in Tempeh milk powder processing with antioxidant properties	Widya Agustinah and Sheriena Cendana
	7	14.30 - 14.45	Black soldier fly (*Hermetia illucens* L.) larvae cultivation with coconut endosperm waste and soybean curd residue using modular fly hive	Marcelino Putra Perdana, Muhammad Arifuddin Bara, Lela Wahyu Anggraeni, Ramadhani Eka Putra and Muhammad Yusuf Abduh
	69	14.45 - 15.00	Comparison of cassava major diseases occurrence between sweet and bitter cultivars in Regency of Gunungkidul, Special Region of Yogyakarta	Siti Nur Aisyah
	86	15.00 - 15.15	Abundance of halotolerant nitrogen fixing *Rhizobacteria*, C-organic of Soil, chlorophyll content and growth of rice plants due to different composition and dosage of organic ameliorant on saline ecosystems	Fiqriah Hanum Khumairah, Tualar Simarmata, Mieke Rochimi Setiawati and Betty Natalie Fitriatin
	87	15.15 - 15.30	Application of raised bed multilayered media on production of red bean (*Phaseolus vulgaris* L.) and corn (*Zea mays* L.) in monocropping and intercropping systems	Miftahul Jannah, Sherin Hidayat, Tasnim Aina, Taufik Taufikurahman and Andira Rahmawati
	57	15.30 - 15.45	Development of a Bee Technopark in Bukit Sandy, Bandung	Gina Meliana Sabila, Rika Alfianny and Muhammad Yusuf Abduh

Day 2, Thursday, 14 October 2021

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
1	5	14.00 - 14.15	Guided bone regeneration membrane from bio-resource with tailored properties	Bidhari Pidhatika
	39	14.15 - 14.30	Computer-aided detection of lung cancer from CT-scan images with visual insights using deep convolutional neural network	Renard Elyon Imawanto, Ghiffary Rifqialdi, Amadhea Yudith and Adrian Rinaldo
	15	14.30 - 14.45	The effect of chitosan: polycaprolactone ratio for microencapsulation of *Acalypha indica* Linn extracts	Maizatul Akmal Johari, Azlin Suhaida Azmi, Jamarosliza Jamaluddin, Rosnani Hasham and Fathilah Ali
	85	14.45 - 15.00	The effectiveness of chitosan soaking in polyester-cellulose Dayak Woven as in vitro antimicrobial mask	Erni Yupita Febila Sari Br Sembiring, Velyn Claristhya, Putri Adiba Resky and Cico Jhon Karunia Simamora
	44	15.00 - 15.15	The effect of acetic acid/formic acid pulping on pulp properties of empty fruit branches	Lili Melani, Ihak Sumardi, Anne Hadiyane, Alfi Rumidatul and Hyoung-Jin Kim
	21	15.15 - 15.30	Extraction of lignin from oil palm empty fruit bunches as filler in polylactic acid (PLA)bio-composite for 3D printing application	Mohammad Shahrizad Pairon, Fathilah Ali, Hazleen Anuar, Farah Ahmad, Jonghwan Suhr and Mohamed Elwathig Saeed Mirghani
	30	15.30 - 15.45	The ability of hydrocarbon degrading bacterial isolates from Paotere Harbor Waters in producing biosurfactants	Adiputra Rahman and Dirayah Rauf Husain
	20	15.45 - 16.00	Enhanced modified graphene oxide antifouling membrane for lead removal from wastewater	Nik Rashida Nik Abdul Ghani, Mohammed Saedi Jami, Nurul Sakinah Engliman, Md. Zahangir Alam, Wan Wardatul Amani Wan Salim and Ebrahim Mahmoudi

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
2	80	14.00 - 14.15	Isolation of compounds with tyrosinase inhibitory activity from the methanol extract of *Meniran* Herbs (*Phyllanthus niruri* Linn.)	Syefira Salsabila, Rika Hartati, Ariranur Haniffadli, Nurinanda Prisky Qomaladewi, Laode M.R. Al Muqarrabun, Andi Rifki Rosandy, Agus Chahyadi and Elfahmi
	81	14.15 - 14.30	Method development of quercitrin enrichment from Asthma-Plant (*Euphorbia hirta* L.) using aromatic macroporous resin	Sumail Sidik Ode Ishak, Rika Hartati, Ariranur Haniffadli, Nurinanda Prisky Qomaladewi, Laode M.R. Al-Muqarrabun, Andi Rifki Rosandy, Agus Chahyadi and Elfahmi
	82	14.30 - 14.45	Implementation of dimer-based screening system in *Escherichia coli* BL21(DE3) for selection of hiv protease inhibitor	Miftahul Faridl, Marchia Stefania, Jeremia Oktavian, Yana Maolana Syah and Azzania Fibriani
	83	14.45 - 15.00	Metagenomics analysis of microbial co-infection in SARS-CoV-2 patients from West Java, Indonesia	Miftahul Faridl, Popi Septiani, Husna Nugrahapraja, Karimatu Khoirunnisa, Ema Rahmawati, Cut Nur Cinthia Alamanda, Rifky Walujayati Rachman, Ryan Bayusantika, Rini Robiani and Azzania Fibriani
	52	15.00 - 15.15	Amelioration of diabetes parameters in rats model treated with mixture of andrographolide and gallic acid	Tet Soon Wong, Fatahiyah Mohamad Tap, Zanariah Hashim, Hassan Fahmi Ismail and Fadzillah Adibah Abdul Majid
	53	15.15 - 15.30	Anti-inflammatory and anticancer activity of sea cucumber compounds as NFκB inhibitor	Teresa L. Wargasetia, Hana Ratnawati, Nashi Widodo and Jantje W. Souhaly
	67	15.30 - 15.45	Identification and characterization of plasma protein types of COVID-19 patients that have been confirmed negative PCR for <1 month with SDS-PAGE method	Sri Anggarini Rasyid, Titi Purnama and Nining Asriani
	63	15.45 - 16.00	Ethnopharmacology, phytochemistry and toxicity activity of ten medicinal plant from Central Sulawesi	Lisna Efiyanti and Gunawan Pasaribu

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
3	36	14.00 - 14.15	Antioxidant capacity and total phenols of wild poinsettia (*Euphorbia heterophylla*) as tea infusion	R. Amilia Destryana, Dyah Ayu Fajarianingtyas, Aryo Wibisono, Edo Hariyanto, Yuli Witono and Iwan Taruna
	40	14.15 - 14.30	Effect of propolis addition, brewing time and temperature on total phenolic content, antioxidant activity and sensory properties of cascara	Muhammad Yusuf Abduh, Diah Nofitasari, Amadhea Yudith Eryanti and Mia Rosmiati
	48	14.30 - 14.45	Correlation of microclimate with the concentration of caffein and chlorogenic acid in robusta coffee from five different cultivation areas in West Java	Suci Awaliyah, Erly Marwani and Sri Nanan B. Widiyanto
	50	14.45 - 15.00	Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a soxhlet extraction method	Ghiffary Rifqialdi, Ima Mulyama Zainuddin and Muhammad Yusuf Abduh
	77	15.00 - 15.15	Bioassay-guided isolation of α-glucosidase Inhibitor from Katuk (*Sauropus androgynus* Linn.)	Nanda Putra, Muhamad Insanu, Ariranur Haniffadli, Nurinanda Prisky Qomaladewi, Laode M.R. Al Muqarrabun, Andi Rifki Rosandy, Agus Chahyadi and Elfahmi
	78	15.15 - 15.30	The selection of Indonesian medicinal plant natural compounds as Akt inhibitor candidates by using molecular docking study approach	Aisyah and Azzania Fibriani
	66	15.30 - 15.45	Pregnancy outcome and mammary development of gravis mice treated with ethanolic extract of bitter melon (*Momordica charantia*) leaf	Gratiana E. Wijayanti, Rakhma S Brayantami, Ine Nurmala, Priyo Susatyo and Sorta Bi Simanjuntak
	99	15.45 - 16.00	Analysis of the potential of flavonoid and xanthone compounds from various Indonesian plant extracts as MEK1 and ERK2 inhibitors: A molecular docking approach	Nadila Fitri Aniza, Marselina Irasonia Tan and Reza Aditama

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
4	88	14.00 - 14.15	In silico drug repurposing study: Computational screening for drug compounds candidate that are potentially used as SARS-CoV-2 Main Protease (Mpro) dimerization inhibitor	Muhammad Hamzah S. Azmi, Audrey A. P. Taharuddin, Azzania Fibriani, Yana M. Syah, Reza Aditama and Ernawati A. Giri-Rachman
	89	14.15 - 14.30	In silico screening of Indonesian natural active compounds as dimerization inhibitor of C-Terminal domain of SARS-CoV-2 nucleocapsid protein by molecular docking study	Audrey A. P. Taharuddin, Riyanti W. Syavitri, Muhammad Hamzah S. Azmi, Ernawati A. Giri-Rachman and Azzania Fibriani
	3	14.30 - 14.45	Prediction of SARS CoV-2 non structural genes (3C Like Protease) as a Covid-19 peptide vaccine candidate	Yani Suryani, Isma Dwi Kurniawan, Salsabila Aliansi and Opik Taupiqurrohman
	26	14.45 - 15.00	Modified pectin-chitosan composite as potential biomaterials for mucoadhesive drug delivery system	Theodore E. Leonard, Alvaro F. Liko and Pietradewi Hartrianti
	98	15.00 - 15.15	Inhibition potential analysis of flavonoid and xanthone compounds from various Indonesian plants against Bcl-2 and Bcl-xL with molecular docking	Muhammad Rayhan Akbar Bunyamin, Marselina Irasonia Tan and Reza Aditama
	92	15.15 - 15.30	Multi-epitope vaccine design against SARS-CoV-2 for Indonesia population using reverse vaccinology approach	Brigitta Claudia, Husna Nugrahapraja and Ernawati Arifin Giri-Rachman
	93	15.30 - 15.45	Multi-epitope vaccine design against dengue virus for Indonesian population with reverse vaccinology approach	Kelvina Gemilang, Ernawati Arifin Giri-Rachman and Husna Nugrahapraja
	96	15.45 - 16.00	Dengue Diagnostic Kit "DENVIT Real-Time PCR" for early detection of dengue in Indonesia	Azzania Fibriani, Karimatu Khoirunnisa and Denti Rizki Kinanti

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
5	23	14.00 - 14.15	Cellulolytic and amylolytic activity of *Actinobacteria*-like isolates from litter in the Galunggung Hot Springs Area, West Java	Arni Setianingsih
	27	14.15 - 14.30	Peatland microbial diversity from Sinar Wajo Village, Jambi by Culture-Dependent and Culture-Independent	Alma C. Aristia and Pingkan Aditiawati
	31	14.30 - 14.45	The viability test of phosphate solubilizing microbes on various carriers during storage	Betty Natalie Fitriatin, Mega Kartika Hermawan and Nabila Syifa Ariani
	32	14.45 - 15.00	Expression of seven key enzymes for artemisinin biosynthesis in *Escherichia coli*	Tresna Lestari, Elfahmi Elfahmi, Asep Gana S and Catur Riani
	84	15.00 - 15.15	Development of screening system for compounds that potentially inhibit dimerization of cytoplasmic domain of PhoR in *Mycobacterium tuberculosis*	Nathanael Steven, Mellysa Rahmita, Yana Maolana Syah, Azzania Fibriani and Ernawati Arifin Giri-Rachman
	43	15.15 - 15.30	The immune system of the decomposer insect *Hermetia illucens*	Allegra Phelia Amadea Manurung, Shanty Rahayu Kusumawardani, Agus Dana Permana and Tjandra Anggraeni
	6	15.30 - 15.45	Optimization of extraction process and determination of bioactive compounds from Indonesian Coffee Cherry Husk	Sophie A. Raharjani, Arlene, Jessica Angelia, Angela Justina Kumalaputri, Agus Cahyadi and Muhammad Yusuf Abduh
	64	15.45 - 16.00	Optimisation of culture condition for Sacha Inchi (*Plukenetia volubilis*) callus induction	Norsyahira Rosle, Widya Abdul Wahab, Muhamad Fahmi Yunus and Tamil Chelvan Meenakshi Sundram

Breakout room	Paper ID	Time (GMT+7)	Title	Authors
6	35	14.00 - 14.15	Antibacterial property of non-crustacean based chitosan from selected fungi and insect larvae	Tri Ramadianti Shafitri, Maryam Jamilah, Mochamad Firmansyah, Robert Manurung and Muhammad Yusuf Abduh
	34	14.15 - 14.30	Formulation & evaluation of reconstituted dry yogurt from Whole Cow's Milk	Ira Rum, Elis Lisnawati and Garnadi Jafar
	65	14.30 - 14.45	Formulation of sol-gel coating with addition of spora *Bacillus* sp. and biosurfactant as an inhibition agent for the biocorosion of St-37 steel in sea water	Ahdina Karima, Isty Adhitya Adhitya Purwasena and Lia Amelia Tresna Wulan Asri
	38	14.45 - 15.00	Microwave-assisted synthesis of polyurethane and its application - a Review	Nur Izzati Binti Mohd Razali, Fathilah Binti Ali, Azlin Suhaida Binti Azmi and Tuan Noor Maznee Binti Tuan Ismail
	46	15.00 - 15.15	Effect of shipping container modification and different types of packaging system on banana quality after transportation simulation	Putri Adiela Agson-Gani, Abryanto Siliwangi, Setiawan, Agus Dana Permana and Khalilan Lambangsari
	56	15.15 - 15.30	Bio-management analysis for integrated cultivation stingless bees with citrus plantation at Bukit Sandy, Bandung	Jessica Gita Adjani, Rijanti Rahaju Maulani and Muhammad Yusuf Abduh
	55	15.30 - 15.45	Factors behind variation in litter decomposition rates between two broadleaf secondary forests and pine forests in the Tropical Region of South Sulawesi, Indonesia	Supadma Putra, Putu Oka Ngakan, Amran Achmad and Toshihiro Yamada

TABLE OF CONTENT

ABSTRACT:

PLENARY SPEAKER

Valorization of Indonesian bioresources towards industrial symbiosis and circular bioeconomy

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Abstract

The linear fossil-based economic paradigm on which we have relied since 200 years ago has delivered substantial global socio-economic and technological development, but at the price of escalating resource use, global environmental degradation, and unprecedented humaninduced climate impact. In response to that impact, concepts of industrial symbiosis and circular bioeconomy are first presented. Valorization of bioresources becomes a sustainable alternative against the constant depletion and environmental problems of fossil sources necessary for the production of chemicals and fuels. In this context, a wide range of renewable raw materials can be obtained from bioresources in all biomass fractions, both primary and secondary metabolites, and different thermochemical and biological conversions can be applied. Three bioresources that are interesting platforms as the base of bioindustries are presented, ie: starch (sugar platform), lipid (carbon-rich chain platform), essential oil (plant products platform). This review mainly focuses on the synthesis of configurations, often referred to as process synthesis, in which many kinds of process operations are configured into flow sheets, and was performed from experience gained in similar processing situations, with little formal methodology. Special emphasis is done on the development of new products and production processes for the efficient production of fuels and chemicals from starch.

Keywords: Circular Bioeconomy, Industrial Symbiosis, Valorization, Process Synthesis, Thermochemical and biological conversions.

BioProducts, here, there, everywhere!

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Abstract

Indonesia is strategically positioned to be a key leader in Bioscience and Biorefinery. With its 17,000 Islands cumulating over 1.9 Million Km^2 of fertile land located at the equator (14th largest country) and a population of 270 million (4th largest), Indonesia has both the resources, the market and the biodiversity to achieve this. The Bioeconomy is a significant contributor to the economy with Palm oil, Rubber and Forest Products representing over 12% of its 186B$ exports (2019). Primary concerns are the optimal use of its land and forest resources, given the challenges of global climate change. Lignocellulose is used for energy, chemicals, and materials. Driven by the demand for biosourced replacements of petro-chemical based products, there has been significant progress especially in the development of materials and chemicals in the last few years. This presentation will analyse a series of examples of processing lignocellulose into functional materials for agriculture, biomedical, industrial and personal care applications. Here, we focus on the relationship between structure and functionality and the effect of processing. Four examples will be presented. After a brief overview of nanocellulose, gel formation and drying of hydrogel into cryofoam, application of nanocellulose in agriculture as hydro retentor for plant growth (Spinach and Boy Choy) will be discussed. The second example is engineering these foams into superabsorbent for personal care and packaging application. The third example is on biomaterials. Here we grow colon organoids in nanocellulose hydrogels. Organoids are mini-organs for medical and diagnostic use. The effect of ion crosslinking, peptide grafting for biocompatibility, blending with fibrinogen for thermosensitivity is analysed. Last, UV absorbent grafted cellulose nanocrystals (CNC) by click chemistry are discussed for cosmetic, paint and material application. It is my objective to present lignocellulosic polymers as functional materials now competitive for advanced applications and as petrochemical replacements in existing products.

Valorization of biomass to produce biofuels and platform chemicals using the biorefinery concept

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Abstract

The identification and subsequent commercialization of added value chemicals from biomass is high on the global research and development agenda. An attractive approach involves the conversion of suitable biomass sources to products that are already on the market place and commercially available (drop-in approach). As such, this strategy exploits existing value chains, markets and infrastructure, which will speed up the pace of the development and reduce investment costs. In this presentation, research activities in our group aiming at the identification of suitable catalytic technology for particularly aromatics from biomass sources will be reported. The focus will be on catalytic pyrolysis in combination with the use of biomass residues.

Keywords: biomass, valorization, drop-in approach, aromatics

Nanocelluloses: New bioresource materials for future society

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Abstract

Nanocellulose is nano-structured cellulose including cellulose nanocrystal, cellulose nanofibril or bacterial nanocellulose, etc. Use of cellulose nanofibrils and their chemical modifications have been investigated to improve usefulness of wood pulp fibers as new bioresource based materials. CNF and CNF-based composites were prepared and used to improve the thermal energy storage performance of sodium acetate trihydrate (SAT), which is a good phase change material with a sharp phase change temperature. Results indicate that adding 0.8% of CNF to SAT increased the viscosity, enhanced solid-like rheological behaviors, and successfully eliminated phase separation of SAT. Owing to the excellent dispersing capability of CNF, the aggregations of nanoparticle additives were avoided in the prepared based composites, which improved the thermal conductivity of PCM. CNF aerogels with high water repellency and shape recovery have been developed and used for thermal storage medium and efficient metal ion adsorbent. Possibility of applying CNF for surface enhanced Raman spectroscopy sensors and paper packaging have been investigated, and brief results will be introduced.

Keywords: Cellulose nanofibrils, Thermal storage, Aerogel, SERS, Packaging

Improving nutritional qualities of rice and cassava for human health and industrial applications

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Abstract

Projections show that the world population will grow to more than 9 billion people by 2050. This requires provision of sufficient and nutritious food to promote human health and industrial production. To accomplish we must increase micronutrient content and modify starch qualities in staple crops. Major crops such as cassava, maize, potato, rice and wheat are rich in starch and together they provide more than 60% of the carbohydrate calories consumed worldwide. People for whom these crops are the primary staple food receive enough calories but they are often malnourished because the seeds, tubers and roots of these plants do not contain enough of the necessary vitamins and minerals such as iron for a healthy diet, often causing iron-deficiency anemia. Achieving higher micronutrient content for health and nutrition or modifying starch quality is often not possible with available breeding germplasm, especially in cereals and clonally propagated crops such as cassava. We are employing genetic engineering technologies and CRISPR-Cas9 strategies to increase the iron and vitamin content of rice and cassava, modify starch quality in cassava, and increase cassava storage root yield. My presentation will outline the rationale for our research and development, and provide examples of our recent achievements.

Keywords: Micronutrients, starch quality, rice, cassava, genetic engineering

The development of Indonesian local COVID-19 vaccine in ITB

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Abstract

In Indonesia, there have been 4,225,871 confirmed cases of COVID-19 with 142,560 deaths, reported to WHO (8th October 2021). Despite of significant progress made in vaccination, problem is still encountered due to dependence on Covid-19 vaccine production. In order to overcome this problem, the multidiciplinary ITB research team under the "Merah Putih COVID-19 Vaccine Consortium" flag are developing Indonesian local COVID-19 vaccine. The ITB team adopted two different platforms,namely adenoviral vector and protein subunit vaccine. In the laboratory scale, the recombinant adenoviral vector carrying a gene encoding Spike protein of SARS-Cov-2 designated as Adeno-Spike has been successfully generated. The preliminary immunogenicity study in mice have shown that the Adeno-Spike is capable to induce high titer of antibody. In parallel, recombinant *Escherichia coli*, *Pichia pastoris* and *Hansenulla polymorpha* for generating protein subunit vaccine candidate, have been also developed. Receptor binding domain (RBD), the region of the Spike protein in SARS-Cov-2 that mediates viral binding to the ACE2 receptor of target host cells,was successfully expressed in recombinant *E.coli*. Recombinant *P. pastoris* and *H. polymorpha* with gene encoding a fusion of RBD with foldon, have been also constructed. Immunogenicity study in mice also revealed that the recombinant RBD-*E.coli* is immunogenic. Taking of all these results together, these developments have implications, not only for establishing technologies towards fulfilling the needs of local vaccine, but more importantly these experiences will strengthen ITB and Indonesia readiness to deal with infectious disease problems and next pandemic.

Reverse Vaccinology: A bioinformatics approach to accelerate the biomedical research

Husna Nugrahapraja

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Abstract

The vast production of data in life sciences research has accelerated research productivity in the last decade. However, since the term "bioinformatics" was coined at the beginning of the '90s, bioinformatics-based research in life sciences is foregone, primarily when genomics and post-genomics are widely used as the core of life sciences research. Sequencing technology development, like Next-Generation Sequencing (NGS), enables big data production and provides a vast database for the study. However, the complexity of the big data produced in life sciences still becomes a bottleneck to accelerate the research because the researcher will enter the data jungle. Therefore, bridging biological big data analytics into practical knowledge is necessary to encompass the traditional way of observing biological phenomena, known as translational bioinformatics. Here, we proposed reverse vaccinology as part of the translational bioinformatics approach to accelerate biomedical research, which relies on the computational methods and tools. Several topics will be discussed and highlighted using based on our experience in the last three years.

Development of high value natural products from tropical plants

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Abstract

The tropics are regions of the Earth that lie roughly in the middle of the globe and receives warm and wet conditions throughout the whole year. Due to this condition, it is blessed with a treasure of high biodiversity of flora and fauna. The tropical plants and animals' grow well all year round, and foods are abundant. If the crop production management does not plan and is not done carefully, there will be excess food resources and wastage. Among the tropical fruits involved are papaya and pineapple. Both these tropical plants are known as sources for popular tropical fruits that consume globally. However, the price of each fruit is not on the high side, especially in the tropic's region. Warm temperature in the tropic's region reduces the papaya and pineapple fruits freshness. And reduce its quality, shelf life, and price. With the advent of biotechnology and bioprocess engineering, these resources are converted into high-quality products. This paper presents a case study of two high-value natural products produced from tropical plants. There are bromelain and papain enzymes. The fruit and stem of the pineapple produce bromelain enzyme and the latex of papaya yield papain enzyme. Both enzymes are expensive. Therefore, the production of a high value product, such as bromelain and papain enzymes are an advantage to the farmers. The pharmaceutical, food, feed, and cosmetics industries used bromelain and papain widely and created more market demands. In conclusion, the low-value tropical plant resources become a high-value product with the help of biotechnology and bioprocess engineering. More products from the tropic's region are waiting to be explored in the future

Keywords: Bromelain; papain; papaya, pineapple, natural product.

Natural based nutraceuticals for improving human health

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Abstract

Inflammation is very critical for many diseases. Natural food resources and dietary intake can greatly improve the inflammation and terminate the advanced disease development. Phytochemicals from daily vegetables, fruits and foods are found to suppress the inflammation by specific pathway. Propolis is obtained from bees' nest and contains thousands of pyotochemicals. Propolis extracts were used to evaluate the bioactivities by using cell model, animal model and human clinical trial and confirm its real application. Results clearly show that, propolis extracts greatly inhibit the inflammation through NFκ-B in cell and animal models. Intervention in oral submucous fibrosis, leukoplakia and oral carcinoma patients strongly showed propolis extract improve the inflammation, syndrome and reduce tumor size. Caffeic acid phenethyl ester (CAPE) was the major contributor for antiinflammation. CAPE dose-dependently inhibited IFN-γ-induced Try701 and Ser 727 phosphorylation in STAT1. It was also observed that CAPE inhibited promoter activity of IP-10 gene and the secretion of IP-10 protein. CAPE has very poor bioavailability and stability, its modified similar compound K36 were also found positive effect on neurodegeneration.

Keywords: Propolis, NFκ-B, CAPE, STAT1, K36

ABSTRACT:

PARALLEL SESSION

[ID-2]
Pectin extraction optimization using closed vessel microwave assisted extraction to synthesize amidated pectin polymeric surfactant of Pacitan Sweet Orange Peel (*Citrus sinensis* L. Osbeck cv. Pacitan)

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Abstract

Pacitan sweet orange (*Citrus sinensis* L. Osbeck cv. Pacitan) peel contains pectin that can be extracted by u closed vessel microwave assisted extraction. This study was divided into 2 phases. The first phase was aimed to obtain the best yield and pectin content by optimizing extraction parameters such as solid:liquid ratio, temperature and duration. Meanwhile, the second phase was aimed to obtain the best degree of amidation by optimizing pectin:octadecylamine ratio and duration in the synthesis of amidated pectin octadecylpectinamide) as a polymeric surfactant. Response Surface Methodology (RSM) was applied in to 2 different phases of experimental work. While the first phase of optimization was conducted by Box-Behnken Design, the second one was conducted by Central omposite Design. At the first stage, the optimum conditions were observed at 65^0C for 7 minutes of extraction with 1:51 (g/ml) solid:liquid ratio. All attributed parameters of optimized pectin such as 5.31% of water content, 752.42 g/mol of equivalent weight, 39.60% of methoxyl content, 79.63% of galacturonic acid level and 68.39% of esterification content indicates that the optimized pectin is classified as high methoxyl pectin. All of these specification is also in accordance with the International Pectin Producers Association (IPPA) standard. At the second experimental stage, the optimum degree of amidation in producing octadecyl-pectinamide were observed at the level of 26.19% with 1:2 (g/g) pectin:octadecylamine ratio (g/ml) for 41 hours of reaction time. The surfactant chemical properties such as water content (4.06%) and the Hydrophile-Lipophile Balance/HLB value (6.71) have fulfilled the Joint FAO/WHO Expert Committee on Food Additives (JECFA) standard.

Keywords: Pacitan sweet orange (*Citrus sinensis* L. Osbeck cv. Pacitan), pectin, microwave assisted extraction closed vessel, polymeric surfactant of octadecylpectinamide, response surface methodology

[ID-3]
Prediction of SARS CoV-2 non structural genes (3C Like Protease) as a Covid-19 peptide vaccine candidate

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Abstract

This study aims to obtain epitope sequences (peptide) that can used as vaccine candidates for the Covid-19 by analyzing the non-structural genes of the SARS-CoV-2 immunity through an immuninformatics approach. The analysis involves several web-based software such as NCBI, BLAST, IEDB-AR, Emboss Water, Accelryss Discovers Studio, and Cabsdock. The analysis showed that the NSP5 (3C Like Protease) gene has the potential to be a candidate source for the SARS-CoV-2 vaccine because it is not homologous to the human genome. The peptide sequence that can be used as a source of vaccine candidates is FLNRFTTTL (Phenylalanine, Leucine, Asparagine, Arginine, Phenylalanine, Threonine, Threonine, Threonine, Leucine) which has a low IC50 value of 9.14 nM and a low percentile rating of 0.08 and the resulting free energy of - 5338.13 kcal / mol. The resulting lower value can be a representative source of vaccine candidates because it has a strong affinity for MHC I.

Keywords: Non Structural Genes, 3C Like Protease, Covid-19, SARS CoV-2

[ID-4]
Enhancement of turmeric oil extraction by solid-state rhizome fermentation using *Aspergillus* sp.

*Yohanes Theda[1], Asri Ifani Rahmawati[2], Tinta Komariyah[3] and Muhammad Yusuf Abduh[4]**

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Abstract

This research was aimed to investigate the role of *Aspergillus awamori*, *Aspergillus niger*, and *Aspergillus oryzae* in degrading starch in turmeric rhizome to increase the yield of turmeric oil. Turmeric rhizome as substrate was given 10% wt yeast extract as additional nutrition needed for fungal growth. The fungi were inoculated using spore solution with a concentration of 5x10^7 cells/mL. The substrate was fermented using solid-state fermentation method under controlled environmental parameters: light intensity (~0 Lx), temperature (25-28°C), relative humidity (~99%), and aeration (3.5 L/min). Biodegradation process was conducted for 11 days. Distillation and starch content assay was done on the 7th, 9th, and 11th day. Isolation of turmeric oil was carried out by steam distillation with a substrate to water ratio of 1:5 for 3 hours after drying the substrate to 68-71% moisture content. The results suggest that starch biodegradation successfully increased the yield of turmeric oil. Among the three species, *A. awamori* showed the highest starch biodegradation activity by reducing 62.5% starch within 11 days. However, *A. oryzae* increased turmeric oil yield the most, compared to the other two species with a 199% increase. The main constituents of turmeric oil are β-turmerone, α-turmerone, dan ar-turmerone.

Keywords: *Aspergillus* sp., Biodegradation, Essential oil, Starch, Turmeric, Rhizome

[ID-5]
Guided bone regeneration membrane from Bio-resource with tailored properties

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Abstract

Guided bone regeneration (GBR) membrane with controlled chemical, physical, and biological properties was developed by combining organic bio-resource (gelatin), inorganic (carbonated hydroxyapatite, CHA), and organic synthetic (poly (N,N-dimethylacrylamide), PDMAA) materials. CHA particles plays role as bone minerals that induce bone tissue tissue growth. PDMAA and gelatin, respectively, plays role as biopassive polymer that protects membrane from bacterial contamination in body fluids and as bioactive polymer that is well recognized by body cells and trigger the growth of these cells. Benzophenone molecules were incorporated to the PDMAA chains during the PDMAA synthesis. The polymer matrix, gelatin and PDMAA were covalently crosslinked using benzophenone photocrosslinkers that react following the C,H-insertion mechanism in response to UV light. Controlling the benzophenone content and thus the density of crosslinking in the membrane allows for the control over the level of biodegradability, swelling index, elastic modulus, and cell attachment to the membrane. The membrane with such tailored properties is a potential candidate for applications in GBR procedures.

Keywords: Gelatin, carbonated hydroxyapatite, PDMAA, photocrosslinker, biodegradability, GBR membrane, CH-insertion

[ID-6]
Optimization of extraction process and determination of bioactive compounds from Indonesian Coffee Cherry Husk

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Abstract

This study was conducted to optimize the extraction process of bioactive compounds from coffee cherry husks using maceration and Soxhlet extractions. For maceration, the extraction time (30, 60, 90, 120 min), shaking speed (30, 60, 90, 120 movement/min), and concentration of citric acid (0, 3, 5, 8 % weight/volume) were varied whereas for Soxhlet extraction, the concentration of ethanol (0, 70, and 96 % volume/volume solvent), feed to solvent ratio (1:7, 1:10, 1:12, 1:15 weight/weight) and citric acid concentration (0, 3, 5, 8 % weight/volume) were varied to determine their effect to the yield and concentration of bioactive compounds in the extract particularly total phenolic compounds, anthocyanin, vitamin C, flavonoid, and antioxidant activity. The optimum yield (17.9% weight/weight) for maceration were in the condition of using 96% ethanol with 8% citric acid and stirred at 120 movements/min for 120 min. As for the Soxhlet extraction, the optimum yield (27.6% weight/weight) was at 8% citric acid concentration in 96% ethanol with a feed to solvent ratio of 1:15. The total phenolic content, anthocyanin, vitamin C, flavonoids and antioxidant activity of the extracts were measured at 20.3-21.3 mg GAE/g, 6.0-13.8 mg/L, 1.5-1.7 mg/g, 3.4-3.8% and 2.5-2.7 mg/g, respectively.

Keywords: Bioactive compounds, coffee cherry husk, maceration, Soxhlet, yield

[ID-7]
Black soldier fly (*Hermetia illucens* L.) larvae cultivation with coconut endosperm waste and soybean curd residue using modular fly hive

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Abstract

Black soldier fly larvae (*Hermetia illucens* L.) are widely cultivated as organic waste remediation agent. The larvae are known to have a high sensitivity to changes towards environmental factors such as aeration rate. Therefore, a rearing hive equipped with instrumentation system known as Modular Fly Hive was designed to optimize the larval growth. The aim of this study was to determine the effect of aeration rate and substrate types on the larval growth and productivity, substrate digestibility, and nutrient composition of the larval biomass. The aeration rate was varied from 0–32 m^3/s. Cultivation was carried out using mixed substrate of coconut endosperm waste and soybean curd residue for 27-48 days (temperature range of 20.99-38.93°C, relative humidity of 37.45-93.54%, and light intensity of 3.90-25,469.02 lux). The results of this study showed that cultivation using soybean curd residue with aeration rate of 32 m3/s resulted in the optimal growth performance of larvae with growth rate of larval length and weight valued of 4.08±0.2857 mg/larvae/day and 0.78±0.0058 mm/day, respectively. Based on the proximate analysis, the larval biomass had total protein, lipid, ash, carbohydrate, and fiber in the range of 37.20-48.60%, 9.61-20.02%, 4.80-6.40%, 6.25-12.70%, and 10.00-29.16% respectively. Amino acids in the biomass were dominated by glutamic acid (11.11-12.30%), aspartic acid (8.25-10.35%), leucine (8.09-8.57%), and lysine (6.74-8.14%). Lipids isolated from the larval biomass mainly comprised of lauric acid (28.35-61.68%), linoleic acid (6.27-30.29%), palmitic acid (7.62-15.23%), and myristic acid (5.05-14.34%).

Keywords: Aeration rate, coconut endosperm waste, *Hermetia illucens* L., Modular Fly Hive, soybean curd residue

[ID-9]
Development of modular cage for controlled cultivation of black soldier fly

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Abstract

Around 16 million tones of organic waste are produced each year from Indonesian households. The organic waste can be valorized to produce valuable bioproducts using Black Soldier Fly (BSF) larvae. The relatively fast conversion rate of waste into high protein and fat biomass makes it favorable to be implemented for domestic use. This research aims to develop a modular cage for cultivation of BSF in a smaller scale, providing a place as efficient as 40x40x40 cm for the complete life cycle of BSF in a single closed system. The cage includes 4 different integrated compartments for its each life stages; larval, prepupal, pupal and adult. It is equipped with a moisture sensor for the substrate and microclimate sensors; temperature, humidity and light. The detected values are stored and monitored using Internet of Things. The changes in environment will trigger different responses, the moisture sensor will read a certain value then decide to turn on the fan or the buzzer to maintain the substrate moisture in the range for the best larval growth. The range recorded from the moisture sensor is between 24,64% to 83,96% resulting a logarithmic growth curve reaching 18,67 mg / larva on the 16th day using chicken feed as the substrate.

Keywords: Black Soldier Fly, Internet of Things, larval growth, modular cage, sensor

[ID-10]
Effectiveness of QIIME tool for detection of genetic variation among freshwater microbiome population

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Abstract

The present investigation entitled "Comparative metagenomic analysis of freshwater microbiome using Bioinformatics Quantitative Insights into Microbial Ecology (QIIME) Pipeline tools" was carried out with the objective to assess genetic variations of microbial population in contaminating water of River Ganga. This study was conducted during the year 2019-20 using next generation sequencing (NGS) plat forms of Bioinformatics tools. The material consists of raw sequences which were already available through SRA database was used in the study. River Ganges experiences an array of anthropogenic pressure due to sewage and industrial discharge, mass bathing etc. It presents the impact of spatial divergence on the bacterial community structure and composition. Viral and bacterial communities are important for ecosystem function as they are involved in critical biogeochemical cycles and controlling host abundance. This study investigates riverine communities around a rural town that influences local water inputs. River confluences are interesting ecosystems to investigate for their microbial community structure and functional potentials. River Ganges is one of the most important and holy rivers of India with great mythological history and religious significance. The Yamuna River meets Ganges at the Prayagraj (formerly known as Allahabad), India to form a unique confluence. The influence of Yamuna River on taxonomic and functional aspects of microbiome at this confluence and its downstream remains unexplored. Results revealed differences in the relative abundance of bacterial and archaeal communities across the confluence. Grouped by the confluence, a higher abundance of Proteobacteria and lower abundance of Bacteroidetes and Firmicutes was observed. This study shows the microbial community variations found in river water effectively by using QIIME bioinfomatical tool.

Keywords: Metagenomics, water analysis, River Ganga, microbial population, NGS

[ID-11]
Isolation of essential oil from *Zingiber officinale* through maceration and pre-treatment with *Aspergillus niger*

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Abstract

Red ginger is an industrial commodity that has a large market and potential in Indonesia. One of the problems involved in the production of oil using red ginger is its low essential oil yield. This study aimed to increase the yield essential oil by pre-treating red ginger rhizome (*Zingiber officinale* var. Roscoe) with *Aspergillus niger* followed by maceration with methanol. Ginger rhizome was cleaned and sterilized via exposure to ultraviolet light for 30 minutes. *Aspergillus niger* inoculum (10^5 spores/g of red ginger rhizome) was added to red ginger rhizome in a tray. Fermentation was carried out at room temperature (25-30℃), low light intensity (~0 W/cm^2), and high humidity (~99%). The fermentation time was varied from 0 to 9 days. The yield of red ginger oil increased from 2.19% to 2.85% as the fermentation time increased from 0 to 9 days. Bioactivity of the red ginger oil was determined using a Kirby-Bauer method. The red ginger oil demonstrated an antimicrobial activity towards *Escherichia coli* and *Staphylococcus aureus* bacteria with inhibition zones of 0.3-0.2 cm and 0.65-0.5 cm, respectively. The diffusion coefficient for the maceration of red ginger oil were also determined using different models; desorption kinetic model, mass transfer kinetic model and Lagergren's adsorption kinetic model with and the values show a relatively good agreement in the range of 1.98×10^{-12} to 2.49×10^{-12} m^2/s.

Keywords: *Aspergillus niger*, Bioactivity, Biodegradation, Maceration, Red ginger oil

[ID-12]
Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a maceration method

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Abstract

Propolis is a resinous substance produced by bees which has high economic value due to their active compound content. This study investigated the effect of difference bee species on the productivity, yield, characteristics, and antimicrobial properties of propolis extracts. In this study, three bee species; *Tetragonula laeviceps*, *Tetragonula biroi*, and *Tetragonula drescheri* were cultivated in Modular Trigona Hive (MOTIVE) hives and fed with *Pinus merkusii* resin. The MOTIVEs used in this study were installed with sensors to record microclimate data in the hive and the total activity of bees entering and leaving the hive. In this study, the yield of propolis extract obtained from *T.laeviceps*, *T.biroi*, and *T.drescheri* were 15.12±1.23; 20.32±4.83; and 24.17±5.99%, respectively. The phenolic content of the propolis extract of *T. laeviceps*, *T. biroi*, and *T. drescheri* were 343.93±44.32; 123.81±24.69; and 225.87±70.36 mg GAE/g, respectively, while the flavonoid content were 35.77±9.94; 5.48±3.31; and 14.57±9.3 mg QE/gr, respectively. The active compounds contained in propolis were analyzed by Gas Chromatography-Mass Spectrometry (GC-MS), the result showed that the active compound content in propolis was similar to the *Pinus merkusii* resin. Anti-microbial properties in propolis extract were tested by the Disk Diffusion method on *Staphylococcus aureus* bacteria culture. The results showed that the 6,6 mg/ml concentration of propolis extract of *T.laeviceps* and *T.biroi* has active antibacterial activity on *S.aureus* with inhibition zones of 7.70 mm and 6.68 mm, respectively.

Keywords: Active compound, MOTIVE, *Pinus merkusii*, Propolis *Tetragonula* sp.

[ID-13]
Nonthermal plasma over an aqueous solution surface for lignin valorization at atmospheric pressure

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Abstract

Lignin, as the major component of lignocellulosic, is potential sources for energy and chemical feedstock. Here, nonthermal plasma at atmospheric pressure with 10 kV applied voltage and 10 kHz frequency was applied over an aqueous solution to depolymerise lignin. As the feed material, lignin was separated from Japanese cedar wood flour utilising a deep eutectic solvent (DES) at 50-120 °C. The Fourier-transform infrared (FT-IR) spectra showed that lignin was separated from the Japanese cedar wood flour in these temperature ranges. Additionally, the ultraviolet-visible (UV-Vis) spectra of the liquid fraction of the products at 280 nm revealed the high lignin content of the extracts. Gel permeation chromatography (GPC) indicated that the average molecular weight of the lignin was 400-700 Da. Matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry (MALDI-TOF MS) showed that the prolonged discharge plasma treatment concurrently promoted the further depolymerisation reaction and repolymerisation of the lignin-derived compounds.

Keywords: Cedar, Extraction, Lignin, Pulsed discharge plasma, Deep eutectic solvent

[ID-14]
Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a reflux extraction method

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Abstract

Propolis is used by bees for natural protection against microbial contaminations, which is made possible by propolis' bioactive properties, making it a potential to be used in medication. Stingless bees, with low honey production, have a relatively high propolis productivity. In Indonesia, stingless bees' cultivation, with species such as *Tetragonula laeviceps*, Tetragonula *drescheri*, and *Tetragonula biroi*, is starting to take off. There also exists an innovation using MOTIVE (Modular Tetragonula Hive) to improve efficiency of the cultivation. These factors catalyse the need for in-depth research on propolis productivity, antioxidant compounds concentration, and antimicrobial activity from propolis extracted with the reflux method to determine the potential for use in medication. For *T. laeviceps*, *T. biroi*, and *T. drescheri*, propolis productivities are 1.70, 1.86, and 2.47 gram/colony/week, with phenolic concentration of 270.97, 98.13, and 170.22 mg GAE/gram, and flavonoid concentration of 30.58, 4.41, and 12.11 mg QE/gram, respectively. Antimicrobial activity was examined by disk diffusion method on *Staphylococcus aureus* culture. The research shows that propolis' productivity positively correlates with body size of the stingless bee and is also affected by the internal needs of the colonies and environmental microclimate.

Keywords: Antimicrobial activity, bioactive properties, propolis, reflux extraction, stingless bee

[ID-15]
The effect of chitosan: Polycaprolactone ratio for microencapsulation of *Acalypha indica* Linn extracts

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Abstract

Chitosan is a non-toxic and biodegradable polymer. It is soluble in acidic aqueous media and insoluble in higher pH media. Chitosan has been modified to improve its properties such as stability and the modified derivatives have been widely used for drug delivery. Selection of the compatible polymer is important to ensure it can be compatible with *Acalypha indica* extract. The aim of this study is to investigate the effect of chitosan:polycaprolactone(chi:PCL) ratios for the encapsulation of *Acalypha indica* active compounds by emulsion-solvent evaporation method and freeze drying. *Acalypha indica* often considered as a common shrub in a garden but the benefits of this plant has been proven since ancient time. However, active compounds extracted from this plant are normally volatile in normal environment. To overcome this, the active compounds need to be encapsulated to stabilize them and delivered well into the body system. Different ratios of chi:PCL copolymer will be varied for the encapsulation. Freeze drying technique will be further used for drying the chitosan-PCL copolymer loaded *Acalypha indica*. The encapsulated active compound of *Acalypha indica* with chitosan-PCL copolymer will be analyzed in terms of encapsulation efficiency (EE%).

Keywords: *Acalypha indica*, copolymer, chitosan, freeze drying, polymer, polycaprolactone

[ID-16]
Production of cellulase enzyme by solid state fermentation of groundnut shell (*Arachis Hypogea*) using *Trichoderma* sp. and Tempeh yeast

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Abstract

Groundnut (*Arachis Hypogea*) is one of the superior commodities that are widely cultivated in Indonesia. However, groundnut shell is commonly thrown away as waste. Meanwhile, groundnut shell includes as a lignocellulosic biomass which has the potential as a fermentation substrate for cellulase enzyme production. Cellulase enzyme production through solid state fermentation using fungi can yield higher enzyme activity due to favorable fermentation conditions for fungi. This study aimed to determine optimum fermentation time of groundnut shell using *Trichoderma* sp. and tempeh yeast to produce cellulase with a high activity. Solid state fermentation was carried out for 1. 2, 3, 4,5 days at room temperature (25 °C). Cellulase activity produced during the fermentation were 0.053 ± 0.011, 0.053 ± 0.001, 0.078 ± 0.003, 0.102 ± 0.006, and 0.051 ± 0.005 FPU/ml, respectively. Furthermore, mathematical model was also simulated using secondary data of solid-state fermentation to determine the kinetic parameters. The model fits well with secondary data (R^2 = 0.93-0.99). The value of estimated parameters μ_m, K_s, k_d, m_s, $Y_{X/S}$, K_i, k_1, dan k_2 were 1.90 h^{-1}, 4.49 g/g, 0.22 h^{-1}, 0.00007 h^{-1}, 18.26 mg/g, 0.0016 (g/g), 7.0016 U/g.h, and 0.0706 h^{-1}.

Keywords: Cellulase, Groundnut shell, Kinetic parameters, Tempeh yeast, *Trichoderma* sp.

[ID-17]
Cellulase production by solid state fermentation of groundnut shell (*Arachis hypogaea*) waste by *Trichoderma* sp.

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Abstract

Groundnut shell is an abundant waste produced in Indonesia with minimum utilization. The high cellulose content of groundnut shells makes it a suitable substrate for cellulase production. Cellulase production has been considered as an expensive process because of the high cost of pure cellulose that is used as substrate for fermentation. The use of groundnut shells as abundant and cheap raw material for cellulase production can be an option for solving aforesaid problem. This study aimed to determine the effect of solid-sate fermentation time using *Trichoderma* sp. on cellulase activity and determine optimal fermentation time. The fermentation process was carried out at room temperature (25℃), 50% humidity inside the fermentation flask, and substrate and culture ratio at 10:1 for 5 days with measurement of enzyme activity every 24 hours. The value of cellulase activity for 1, 2, 3, 4 and 5 days of fermentation were 0.02; 0.05; 0.07; 0.08; and 0.02 FPU/ml, respectively. In addition, mathematical modeling was also carried out to determine the kinetic parameters of cellulase production process in SSF fermentation system and simulations to estimate enzyme activity with variations in initial amount of substrate. The value of kinetic parameters μ_m, K_s, k_d, m_s, $Y_{x/s}$, k_1, k_2, and K_i were 0.25 h^{-1}; 9.7 g/l; 0.074 h^{-1}; 0.094 h^{-1}; 0.7 g/g; 6.67 IU/g h; 0.039 h^{-1} and 1134 g/l, respectively. The value of maximum cellulase activity for substrate variations of 5, 7, 10 and 12 grams were 0.56; 2.35; 12 and 20 FPU/ml respectively.

Keywords: Cellulase, Enzyme activity, Kinetic parameters, Solid state fermentation, *Trichoderma* sp.

[ID-18]
Valorization of lower grade resin, bark, and fruit of *Styrax sumatran*

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Abstract

Styrax sumatrana or kemenyan tree grows well in North Sumatera, Indonesia and its resin is commonly utilized by the local community. Other parts of kemenyan, such as barks and fruits contain valuable compounds that can be harnessed to produce high value bioproducts. This study examined the effect of different resin grades on the physical parameters and cinnamic acid content, different delignification pre-treatment periods of kemenyan barks with *Phanerocahete chrysosporium* on the amount of extracted saponin from the barks and different fruit ripeness on the composition of the fruits. This study showed that grade IV, V and VI resin contain 21.78 to 24.89% cinnamic acid. The isolated cinnamic acid had a purity of more than 90.9 to 94.3%. Pre-treatment of kemenyan barks able to degrade 15% of the lignin after 21 days of incubation with *Phanerochaete chrysosporium* and increased the amount of extracted saponin up to 7.5-fold higher compared the non-pre-treated barks. Ripe kemenyan fruits had a higher protein and lipid content as compared to the unripe fruits.

Keywords: Cinnamic acid, delignification, *Phanerochaete chrysosporium*, resin, saponin, *Styrax sumatrana*

[ID-19]
Lignocellulose degradation of cinnamon bark (*Cinnamomum burmannii*) by *Aspergillus awamori* to increase cinnamon oil yield

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Abstract

Indonesia is one of the largest suppliers of cinnamon in the world. Cinnamon oil is a product diversification of cinnamon, but its yield is relatively low. *Aspergillus awamori* is known to have the ability to produce lignocellulose-degrading enzymes, hence it could increase the yield of cinnamon oil. This research was conducted to determine the optimum fermentation time of cinnamon bark (*Cinnamomum burmannii*) using *Aspergillus awamori* to increase the yield of cinnamon oil through lignocellulose biodegradation. Fermentation was carried out for of 0, 3, 6, and 9 days. The biggest decrease of the cellulose (19.52%), hemicellulose (40.53%), and lignin (16.84%) content occurred after 9 days of fermentation. Isolation of cinnamon oil from the fermented bark was carried out using hydrodistillation, maceration and Soxhlet methods. The yield of cinnamon oil after 9 days of fermentation for each extraction method was 2.09%, 2.47%, and 3.01%, respectively. Cinnamon oil primarily comprises of cinnamaldehyde as determined by Gas Chromatography-Mass Spectrometry and its content varies with fermentation time.

Keywords: *Aspergillus awamori*, Biodegradation, Cinnamon oil, Extraction, Lignocellulose

[ID-20]
Enhanced modified graphene oxide antifouling membrane for lead removal from wastewater

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Abstract

Rapid industrialization and urbanization in developing countries including Malaysia contributed to high wastewater effluent containing hazardous heavy metals. In Malaysia, the scheduled wastes generated in 2019 were 4.0 million tonnes whereby the power plant, metal refinery, chemical, electrical and electronics industries contributed 57.1% to the total scheduled wastes. The information indicated that these industries accounted for more than half of the scheduled wastes of heavy metals that were discharged into the water. Lead (Pb^{2+}) is one of the highest contaminants' concentrations found in tested water and it falls under Class II risk of toxicity which is moderately toxic. This continuous issue leads to environmental and health concerns worldwide. The reuse of treated wastewater is the key access to discover new water resources. Nanomaterials can be incorporated in the synthesis of the membrane to obtain nanocomposite membrane with remarkable improvement in performance. In this study, nanomaterial of graphene oxide (GO) was used for membrane modification. The fabrication of modified GO membrane was embedded into polyethersulfone by non-solvent induced separation technique for lead removal from wastewater. Membrane hydrophilicity after modification was studied using contact angle measurement and the relative pore size was determined. The performance of the fabricated modified GO membrane was investigated by evaluating pure water flux and Pb^{2+} ion removal by a dead-end filtration system. The results indicated that the addition of GO increased the hydrophilicity of the membrane and the pore size compared to bare PES. Moreover, the utilization of modified GO membrane in the filtration process significantly improved the pure water flux up to 60% and 67.47 % of flux recovery ratio. The pore blocking models analysis indicated that the modified GO membrane was dominated by cake filtration model which assumes the particle accumulation on the membrane surface. Overall, the addition of an optimal amount of GO could be a promising approach for the preparation of enhanced antifouling membrane for wastewater treatment.

Keywords: Graphene oxide, polyethersulfone, nanocomposite membrane, antifouling, wastewater treatment

[ID-21]
Extraction of lignin from oil palm empty fruit bunches as filler in polylactic acid (PLA) bio-composite for 3D printing application

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Abstract

The usage of biodegradable PLA was preferable in 3D printing applications due to environmental concerns. However, the linear microscopic structure of PLA had limited its mechanical strength. The potential use of complex structure lignin from OPEFB could increase the stiffness of PLA. This study aimed to extract the lignin from OPEFB and reinforced it into PLA for 3D printing applications. The lignin was extracted by using 1,4-dioxane with hydrochloric acid as an acid catalyst. After the purification by diethyl ether, the lignin was mixed with PLA for the preparation of filament and used for 3D printing. The 3D printed PLA/lignin bio-composite proceeded with a mechanical test. The yield extraction of lignin from OPEFB by 1,4-dioxane was 8.32%. The Fourier Transform Infra-Red (FTIR) spectrum confirms the carbonyl, methoxy, and hydroxyl group in the extracted lignin. Scanning electron microscopy (SEM) also confirms the extraction of lignin occurs on the surface of OPEFB. The stress-strain graph shows the increase in mechanical strength of PLA after the reinforcement with the addition of lignin. Young's modulus of PLA/lignin bio-composite increases to 9.07% proximately compared to PLA.

Keywords: polylactic acid, lignin, bio-composite, 3D printing, mechanical strength

[ID-22]
Cellulase production by fungal mixed culture in solid state fermentation of groundnut shell (*Arachis hypogaea*) waste

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Abstract

Groundnut (*Arachis hypogaea*) is the second most important legume commodity after soybean in Indonesia. Groundnut is one of the many food sources with very large protein content. Groundnut plant processing mostly focuses on the seeds and unfortunately leaves a lot of waste, especially the shell. Groundnut shell contains a high amount of lignocellulose and can be valorized as a substrate to produce cellulase with fungal cellulosic microbes as a biological agent. This research was conducted to determine the optimum time for cellulosic fungi to produce cellulase enzymes using groundnut shell as a substrate. In this study, solid state fermentation was used with the help of *Trichoderma* sp. and *Aspergillus* sp. as the mixed culture biological agents. Fermentation was carried at room temperature (25°C), 50% water humidity on substrates, and the ratio of substrate to culture was 10:1 with a culture ratio of 1:1. Fermentation lasts for 5 days with data sampling of cellulase activity every 24 hours. The highest enzyme activity obtained on the fourth day, with an amount of 0.12 FPU/mL. Based on the experimental enzyme activities, a mathematical modeling was carried out to determine the kinetic parameters of the cellulase enzyme production. Parameters that influence the production of cellulase are maximum specific growth rate (μ_m), substrate saturation constant (K_s), death cell constant (k_d), maintenance coefficient (m_s), yield coefficient of biomass ($Y_{x/s}$), rate constant of cellulase synthesis (k_1), rate constant of cellulase decay (k_2), and coefficient of substrate inhibition (K_i) were determined, to 0.087; 11.3; 0.004; 0.005; 1.19; 0.004; 0.019; 1130.7, respectively.

Keywords: Cellulase, Groundnut shell, Kinetic Parameter, Mixed Culture, Solid State fermentation

[ID-23]
Cellulolytic and amylolytic activity of actinobacteria-like isolates from litter in the Galunggung Hot Springs Area, West Java

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Abstract

Actinobacteria is a phylum of Gram positive bacteria that produces mycelium and can form spores, and has a high content of G+C DNA. Some types of Actinobacteria are able to produce enzymes such as cellulase and amylase, so they have the ability to degrade cellulose and starch. The ability to degrade cellulose and starch by Actinobacteria is characterized by the formation of a clear zone. This study aimed to determine the growth ability of isolates GL1-2, GL1-9, and GL1-12 on various agar media and temperatures, and to determine the cellulolytic and amylolytic activity of isolates GL1-2, GL1-9, and GL1-12 on 1% CMC (carboxymethyl cellulose) and 1% soluble starch at 40, 45, 50, and 55 °C were incubated for 3, 7, and 14 days. Screening was carried out by inoculation of cultures on agar media with the addition of 1% CMC (for cellulase screening) and 1% soluble starch (for amylase screening), then the media was incubated at 45, 50, 55 and 60 °C for 3, 7, and 14 days. Testing for cellulolytic potential is known through the formation of a clear zone after dye staining by 0.1% Congo red, while amylolytic potential is known through the formation of a clear zone after dye staining by Lugol's iodine. The results showed that the three isolates were able to grow on ISP 1, ISP 2, ISP 3, and MBA agar media which were incubated at 45 °C for 7 days. The three isolates had maximum growth temperature at 55 °C, optimum growth temperature at 45 °C, and minimum growth temperature at 25 °C (GL1-9) and 30 °C (GL1-2 and GL1-12). The three isolates showed cellulolytic activity at temperatures of 40, 45, 50, and 55 °C after being incubated for 7 days. Amylolytic activity was shown by isolates GL1-2 and GL1-9 at temperatures of 40, 45, 50, and 55 °C after incubation for 3 and 7 days, while isolates GL1-12 did not show amylolytic activity at temperatures of 40, 45, 50, and 55 °C after incubation for 7 days.

Keywords: Actinobacteria, Amylolytic, Cellulolytic, Cellulose, ISP, MBA, Starch

[ID-24]
Isolation of essential oil from *Zingiber officinale* through hydrodistillation and pre-treatment with *Aspergillus niger*

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Abstract

Red ginger has been widely used due to its potential to be used as medicine. One way to utilize ginger and maximize its potential is to use the essential oil contained in the ginger. The problem that is often encountered in ginger oil extraction is the low yield. Biodegradation of lignocellulose in the ginger through fermentation with fungi can increase the ginger oil yield. This study aimed to determine the optimum fermentation time of red ginger (*Zingiber officinale* Rosc. var rubrum) by *Aspergillus niger*. The fermentation was carried out at room temperature (25°C) for 3, 6, and 9 days. Isolation of red ginger oil was carried out using a hydrodistillation method for 5 hours. The yield of red ginger oil increased from 1.3% to 1.37% as the fermentation time increased from 3 to 9 days. Antibacterial bioactivity of the red ginger oil towards *Escherichia coli* and *Staphylococcus aureus* was also determined using a Kirby-Bauer method with an inhibition zone of 17 mm and 25 mm, respectively. The diffusion coefficient for the hydrodistillation of red ginger oil has been determined as 2.11×10^-11 m^2/s.

Keywords: Antibacterial bioactivity, *Aspergillus niger*, Diffusion coefficient, Red ginger oil

[ID-25]
Enrichment of growing media using biochar, compost, and nano-silica for the cultivation of *Oryza sativa* L. at Sumedang, Indonesia

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Abstract

Oryza sativa is a very important crop in Asia and its productivity is highly influenced by the growing medium. This study investigated the effect of growing media composition on the growth and productivity of *Oryza sativa* var. Impago 7 cultivated in polybags at Sumedang, West Java, Indonesia, for 126 days. A randomized block design was applied with nine combinations of growing media. Each treatment consisted of five polybags and was replicated three times. Plant height, number of leaves, and tillers were measured at 15, 30, and 45 days after transplanting. The results showed that the highest number of panicles (24 panicles per plant), the weight of dry harvested grain (21.74 g per plant), and weight of dry milled grain (17.83 g per plant) were obtained when cultivated with a growing medium containing soil, biochar, synthetic fertilizer, urea and sprinkled with nano-silica. The growing media composition did not influence the weight of 100 grains because it is more influenced by genetic characteristics. An appropriate combination of soil, biochar, synthetic fertilizer, urea, and sprinkled with nano-silica is recommended as a growing media for cultivating *Oryza sativa* L. var. Impago 7.

Keywords: biochar, growing media, nano-silica, *Oryza sativa*

[ID-26]
Modified pectin-chitosan composite as potential biomaterials for mucoadhesive drug delivery system

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Abstract

Mucoadhesion is one of the strategies that have been sought to achieve colorectal-targeted drug delivery. Dietary fibers, such as pectin and chitosan, have exhibited mucoadhesive properties with various biological activities and are relatively indigestible except in the colorectal area, which is microbially-triggered. Therefore, this study focused on fabricating a pectin-chitosan composite-based drug delivery system loaded with 5-fluorouracil (5-FU), a well-established chemotherapy drug for colorectal cancer (CRC). Moreover, thiolation of pectin was also carried out to further improve the mucoadhesion property; second-generation mucoadhesives specifically adhere via covalent bonds to mucin, in this case through disulfide bond formation. The beads were fabricated using ionotropic gelation with calcium ions. A set of physicochemical characterizations were performed to evaluate their properties, such as the mass, circularity, circular diameter, drug content, and entrapment efficiency. Fourier-transform infrared spectroscopy analysis was also conducted to retrieve the structural information. Furthermore, the swelling, mucoadhesion, and release profile were determined. Finally, an in vitro biological test was observed in the CRC cell line HT-29 and normal cell line HEK-293. The 5-FU-loaded beads had a drug entrapment efficiency of 45-60%, which was enhanced with the thiolation of pectin. Thiolation of pectin also significantly ($p < 0.05$) reduced the swelling capacity while increasing the mucoadhesive property. The drug release profile, however, was similar among all groups. The kinetics were best explained by logistic distribution as rapid release capped at around 70% to be gradually released by the colonic microflora. Therefore, it is suitable for rectal administration to avoid premature release in the upper gastrointestinal tract. The composite also exhibited selective toxicity towards HT-29 cells, highlighting its biocompatibility. In summary, pectin and chitosan-based composite is a potential mucoadhesive biomaterial for primary drug delivery systems.

Keywords: Drug delivery system, thiolated, pectin, chitosan, mucoadhesive, in vitro, colorectal cancer

[ID-27]
Peatland microbial diversity from Sinar Wajo Village, Jambi by Culture-Dependent and Culture-Independent

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Abstract

Peatland was a unique ecosystem because formed from a pile of organic matter that had been stored for thousands of years. Peat soils were acidic, inundated, nutrient-poor, and irreversible when damage occurs. Peat soil microbes had a very important function such as providing nutrients, providing plant growth, and remodeling organic material. The purpose of this research was to study the structure of peatland microbial communities by culture-independent (by Nanopore Sequencing) and culture-dependent (by Peat Water Agar Medium) then determine the potential microbes as PGPM (Plant Growth Promoting Microbes) through its ability to produce cellulase, to produce IAA, to dissolve phosphate, and to fix nitrogen. The peat soil was carried out from Sinar Wajo Village, Jambi. The results of culture-independent microbial isolation showed that the highest abundance of phylum, family, genus, and species of bacterial were Proteobacteria, Acidobacteriaceae, Candidatus Kariobacter, and Candidatus Kariobacter versatilis. Meanwhile, the highest abundance of phylum, family, genus, and species of fungi were Ascomycota, Metschnikowiaceae, Clavispora, and [Candida] auris. The highest culture-dependent bacterial abundance were Rhodanobacteriaceae. Meanwhile, the highest fungi abundance was Zygomycota. Microbes that had the potential as PGPM are Trichoporon loubieri, Penicillium pinophilum, Dyella caseinilytica, Streptomyces fuscigenes, and Streptomyces graminearus.

Keywords: Culture-dependent, Culture-independent, Microbial Diversity, Nanopore Sequencing, Peatland, Plant Growth Promoting Microbes

[ID-28]
Isolation of essential oil from *Zingiber officinale* through steam distillation and pre-treatment with *Aspergillus niger*

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Abstract

Red ginger essential oil (*Zingiber officinale* Rosc. var rubrum) is a potential commodity because of its anti-inflammatory and antimicrobial properties. The common issue in red ginger oil production is low yield caused by the lignocellulose content in the red ginger rhizome cell walls. Preliminary treatment in the form of lignocellulose degradation using Aspergillus niger may increase the red ginger oil yield. This study aimed to determine the effect of lignocellulosic biodegradation of red ginger rhizome on the lignocellulose content, yield, composition, and productivity of red ginger oil. This study also analyzed the antibacterial activity of red ginger oil and determine the diffusion coefficient in the isolation process of red ginger oil using the steam distillation method. Solid-state fermentation was carried out using a spore solution with a concentration of 106 spores/mL at room temperatures (25-28°C), low light intensity (~0 W/cm^2), and high humidity (~99%) with different fermentation time 0, 3, 6, and 9 days. The isolation of red ginger oil was carried out using a steam distillation method for 5 hours. The results showed that lignocellulose degradation increased the red ginger oil yield from 1.33±0.28 to 1.76±0.35% dry weight as the fermentation time increased from 0 to 9 days. The red ginger oil showed an antibacterial activity against Escherichia coli and Staphylococcus aureus with an inhibition zone diameter of 18.5±0.7 mm and 20.5±0.7 mm, respectively. The diffusion coefficient for the steam distillation of red ginger oil has been determined as 2.08×10-11 m^2/s.

Keywords: *Aspergillus niger*, Diffusion coefficient, Lignocellulose biodegradation, Red ginger oil, Yield

[ID-29]
Rhizomicrobiome engineering using the halotolerant N-Fixer-PGPR inoculant for increasing the N-fixers biodiversity, N-Update and rice agronomic traits on saline soils

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Abstract

Rhizomicrobiome is a complex and excellence habitat and shelter to highly diversify of microbial community with specific functions and effects the growth and crop productivity. The research to obtain the isolates of halotolerant nitrogen fixer and plant growth promoting rhizobactreia (HNF-PGPR) from saline rice rhizosphere was done on salinized free N media. Bioassay to select the potential isolate as active ingredient of HNF-PGPR inoculant was done using the rice seedling as indicator. Subsequently, pot experiment to investigate the effect of seed treatment (ST) of inoculant combined with dosage of soil application (SA) on agronomic traits was arranged in randomized block design with 3 replication. Two of promising isolate were selected, characterized and identified biomolecularly as *Pseudomonas stutzer* and *Klebsiella.* The abundance of N-fixer (*Azotobacter* sp. and *Azospirillum* sp.), agronomical traits (N-uptake, growth component and yield) were increased significantly by the application HNFPGPR inoculant. The highest grain yield about 35.1 g clump^{-1} or 6.3 ton ha^{-1} (161, 0 % higher than control) was obtained by the application of 1500 g ha^{-1} and additional seed treatment to soil application of 1500 g ha^{-1} gave a non-significant effect. Inoculant of N-fixer-PGPR could be used to engineer the rhizomicrobiome and alleviate salinity stress.

Keywords: Food security, growth substances, IAA, PGPR, soil health

[ID-30]
The ability of hydrocarbon degrading bacterial isolates from Paotere Harbor Waters in producing biosurfactants

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Abstract

The use of biosurfactans was an alternative and eco-friendly method that was beginning to be developed largely at polluted environmental remediation technologies. The purpose of this study is to understand the correlation between petroleum biodegradation by Marine bacteria and the presence of biosurfactants in invitro. Found a single bacterial insulation Potentially deducing petroleum gradients by producing biofacts. In the culture of the initial phase of exponential has became the ideal culture with emulsification tests have shown the lowest density of optic, and then on chromatograms, it also has shown the shortest carbon chain, as well as on a tensiometer scale, it hasshown the lowest scale of 48.57 dyne/cm from an increase of 4 ml of biosurfactant, it was be evidence of a correlation between the production of biosurfacts and the effort of petroleum degradation on liquid mediums.

Keywords: biosurfactan, petroleum, emulsification, chromatograms, tensiometers

[ID-31]
The viability test of phosphate solubilizing microbes on various carriers during storage

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Abstract

Excessive use of inorganic fertilizers, especially during the green revolution, has caused pollution and contamination of the soil due to accumulated residues. The inorganic fertilizer residues then cause soil compaction, loss of available nutrients and soil organic matter, loss of soil biodiversity which indirectly reduces soil fertility and makes plants more susceptible to disease. Biofertilizers have the potential to optimize soil response to fertilization, improve soil health, and even reduce the need for inorganic fertilizers to achieve sustainable agriculture. One of the types of microbes contained in biological fertilizers that have been proven to be able to replace the need for inorganic P fertilizers and improve soil health and productivity is a group of phosphate solubilizing microbes. The quality of biofertilizers is also determined by the carrier material capable of supporting the growth of inoculants. The purpose of this study was to test the viability of phosphate solubilizing microbes on various carriers during storage The microbes used were *Bacillus subtilis*, *Pseudomonas mallei*, *Burkholderia* sp, and *Trichoderma harzianum*, while the tested carrier material were hydrogel and mixed of peat and compost. The results showed that the hydrogel carrier material was able to better support the growth of P-solubilizing microbes inoculants during storage.

Keywords: biofertilizers, hydrogel, inoculant and peat

[ID-32]
Expression of seven key enzymes for artemisinin biosynthesis in *Escherichia coli*

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Abstract

Biotechnological approaches are becoming widely used in producing natural bioactive compounds such as artemisinin. The expression of seven genes encoding enzymes involve in artemisinin biosynthesis was carried out in this research, those are 1-deoxy-D-xylulose-5-phosphate (DXP) synthase gene (dxs) from *Bacillus subtilis*, isopentenyl-diphosphate Delta-isomerase (IDI) encoding gene (idi) from *Escherichia coli* and five genes originated from *A. annua* that encode enzymes farnesyl pyrphosphate synthase (FPS), amorpha-4,11-diene synthase (ADS), cytochrome P450 monooxygenase (CYP71AV1/CYP), artemisinic aldehyde delta-11(13) reductase (DBR2) and aldehyde dehydrogenase 1 (ALDH1). The seven genes were expressed under the induction of isopropyl-β-D-1-thiogalactopyranoside (IPTG) using *E. coli* as the host cell. The protein resulted were characterized by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and Western Blot. All the protein was successfully expressed under induction of 0.5 mM of IPTG, incubated for 18 hours at temperature of 37 °C. This research lays a promising future to produce artemisinin precursors such as IPP/DMAPP, amorphadiene, artemisinic acid or dihydroartemisinic acid in *E. coli*.

Keywords: biotechnological approach, artemisinin biosynthesis, artemisinin precursors, *Escherichia coli*

[ID-33]
Effects of pH, dosage and contact time on phenol removal using Baobab Fruit shell activated carbon

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Abstract

The performance of a microporous activated carbon prepared chemically from Baobab fruit shell (BFS) for the removal of phenol from aqueous solution was investigated via the batch technique. Baobab fruit shell activated carbon (BF-AC) was characterized using N_2 adsorption–desorption isotherms, scanning electron microscope (SEM), and Fourier transform infrared (FT-IR) were performed for the characterization of. The Brunauer-Emmett-Teller surface area of prepared BF-AC was 1263 m^2/g and micropores volume of 0.4531 cm^3/g. The effect of adsorption parameters such as pH (2-11), BF-AC dose (1-5 g/L), and contact time (5-60 min) was thoroughly investigated. The highest percentage of phenol removal (97.61 %) was achieved at the pH of 2, 15 min of contact time, and 3 g/L of adsorbent dosage. Adsorption experiments indicated that the maximum adsorption capacity (q_m) of the produced activated carbon was 195.48 mg/g adsorbent. Results reveal that BF-AC have an efficient performance for the removal of phenol from aqueous media.

Keywords: Activated Carbon, Activating agents, Chemical Activation, Baobab Fruit Shell, AC Characterization

[ID-34]
Formulation and evaluation of reconstituted dry yogurt from whole cow's milk

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Abstract

Yogurt is a fermented probiotic product made from cow's milk which has a thick texture, white color and sour taste. Plain yogurt is very beneficial for human intestinal health, but the drawback is that plain yogurt has a shelf life of only 10 days at 4^{o}C. Yogurt reconstitution is the process of drying yogurt so that the moisture content of yogurt is reduced or lost then must be dispersed with air when used, and still contains acids (BAL) such as *Streptococcus thermophilus, Lactobacillus bulgaricus, Lactobacillus acidophilus,* and *Bifidobacterium*. Purpose of this research is to make reconstituted yogurt preparations that are still living lactic acid bacteria, so that they can extend the shelf life of plain yogurt. Method used is fermentation and heating <50^{o}C. Macroscopic evaluation using MRSA, MRSB and NA media. Results of the macroscopic evaluation of the reconstituted yogurt, BAL live until the 24th day, this indicates that the heating method can prolong the viability of BAL. The flow time test obtained an average value of 7.83 seconds. Angle test obtained an average of 36.69^{o}. The water content test obtained an average of 6.55%. pH of whole milk is 7.09, pH of plain yogurt is 3.91 and pH of reconstituted yogurt is 4.35. Conclusion of yogurt reconstitution still contains live BAL and all evaluations show that yogurt reconstitution meets the requirements except for the water content because it is more than 5%.

Keywords: Reconstituted dry yogurt, Lactic acid bacteris (BAL), fermentation

[ID-35]
Antibacterial property of non-crustacean based chitosan from selected fungi and insect larvae

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Abstract

Chitosan is a biopolymer derivative from the deacetylation of chitin. Both are mainly produced from crustacean shell but fungi and insects can also be used as an alternative. In this study, chemical characteristics and antimicrobial activities of chitosan obtained from *Mucor* spp., *Rhizopus oryzae* fungi, and black soldier fly larvae has been examined. Fungi were cultivated in a tailor-made medium, incubated at 28 ºC and 150 rpm agitation, 4 days for *Mucor* spp. and 6 days for *R. oryzae*. BSFL defatted with n-hexane. All samples were deproteinized with 2% NaOH at 90 ºC, deacetylated with 10% acetic acid at 60 ºC and precipitated with 30% NaOH. Water, ethanol and acetone was used to remove impurities from pallets. The extracted chitosan was characterized with FTIR Spectroscopy and examined for potential antimicrobial by using disk diffusion method. Chitosan from *Mucor* spp. biomass has the highest recovery (157.3 mg/g biomass), *R. oryzae* 133.1 mg/g biomass and BSFL 4.28 mg/g biomass. However, the chitosan from BSFL has the highest deacetylation degree (84.18%) followed by *R. oryzae* (80.92%) and *Mucor* spp. (80.09%). In this study all the chitosan samples are capable to inhibit the Gram negative (*Staphylococcus aureus*) and Gram positive (*Escherichia coli*) bacteria.

Keywords: antibacterial activity, black soldier fly larvae, chitosan, *Mucor* spp, *Rhizopus oryzae*

[ID-36]
Antioxidant capacity and total phenols of wild poinsettia (*Euphorbia heterophylla*) as tea infusion

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Abstract

The use of wild poinsettia (*Euphorbia heterophylla*) is only considered a wild plant and its use is still as a traditional medicinal ingredient. The potential of this plant is the latex which can be used as a protease enzyme, then the leaves can be used as herbal tea or tea infusion. In order to provide the potential of dried wild poinsettia, the total phenols and antioxidant capacity were measured by the Folin-Ciocalteu method, and their antioxidant capacities were evaluated using DPPH assays. Phytochemical screening of dried wild poinsettia leaves which were dried at different temperatures and drying times showed total phenols and antioxidant capacity which have potential health properties and benefits on human health, such as antiinflammatory, antihypertensive, anticancer, and as antimicrobial agents. The high correlation between total phenolic contents and antioxidant capacities indicated that phenolic compounds could be one of the main components responsible for antioxidant activities of these dried leaves. Generally, these dried leaves had high antioxidant capacities and total phenolic contents, and could be important dietary sources as tea infusion of antioxidant phenolics for prevention of diseases caused by oxidative stress.

Keywords: antioxidant, total phenolic content, wild plant, herbal infusion, tea infusion

[ID-37]
Pre-treatment of spearmint leaves (*Mentha spicata* L.) with *Aspergillus awamori* to increase essential oil yield

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Abstract

In general, cell wall in plant is made up of lignocellulose. The lignocellulose can be degraded by hydrolytic enzymes produced by microorganisms. This study determined the effect of fermentation time using *Aspergillus awamori* towards the lignocellulosic content of spearmint leaves, yield and composition of spearmint oil extracted using hydrodistillation, maceration, and Soxhlet method as well as the diffusion rate constant using a mathematical modeling. Spearmint leaves were fermented for 0, 3, 6, and 9 days. The fermented leaves were dried and isolated using different methods; hydrodistillation, maceration and Soxhlet, respectively. The fermentation process successfully reduced the cellulose content from 37.92% to 19.32%, hemicellulose from 10.67% to 7% and lignin from 31.77% to 12.24%. The spearmint oil yield varies from 0.08% to 2.1%. The essential oil primarily contains carvone up to 77.88% as determined by the Gas Chromatography-Mass Spectra. The diffusion coefficient for the isolation of spearmint oil for all isolation methods have been determined to be in the range of 2.89 x 10^{-11} m^2/s to 3.64 x 10^{-11} m^2/s.

Keywords: *Aspergillus awamori*, hydrodistillation, maceration, Soxhlet, spearmint

[ID-38]
Microwave-assisted synthesis of polyurethane and its application - a Review

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Abstract

Polyurethane (PU) is a type of material that links polymer diols and the isocyanate group. PUs can be functionalized to desired properties by introducing appropriate isocyanates and polyols. PUs can also be made biodegradable by incorporating plant-based polyols. The overview of isocyanates and polyols used in PUs is discussed in this paper. Typically, the synthesis of PUs is through the conventional method. However, the conventional method is both time and energy consuming hence a less time-consuming method which is microwave-assisted synthesis is discussed in this review. On the other hand, PUs has been used extensively in various applications such as coatings, automotive parts, biomedical field, and many more hence it will lead to pollution. Thus, the degradability of polymers is also discussed. This review provides insights into the microwave-assisted synthesis of polyurethane and various applications of PUs.

Keywords: biodegradable plastics, isocyanates, microwave-assisted synthesis, polyols, polyurethane

[ID-39]
Computer-aided detection of lung cancer from CT-scan images with visual insights using deep convolutional neural network

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Abstract

Lung cancer is a leading cause of death worldwide, reach up to 13% of all cancer diagnose with 273 million cancer cases in Indonesia alone. Lung cancer has a high mortality rate caused by difficulty in diagnosing cancer in the early stage. In the practice, if doctors suspected abnormality by CT examination, a cytological diagnosis of lung cells collected by biopsy is first performed. However, this method has a major challenge with malignant lung cell classification. This becomes a problem because early detection is the first step to reduce the mortality rate of lung cancer. In this study, we aimed to automatize the classification of lung cancer from CT scan images using Deep Convolutional Neural Network (DCNN), fine-tuned ResNet 50V2, and fine-tuned Xception. CT scan images were acquired from the IQ-OTHNCCD lung cancer dataset. The original CT scan images first resize to 224x224 pixels. We obtained 416 normal, 120 benign, and 561 malignant CT scan images. The classification precision and accuracy with highest performance achieved by Xception Weighting model with 99.11% accuracy, 99.11% F1 score, and 99.99 AUC score.

Keywords: image classification, lung cancer, weighting, CNN

[ID-40]
Effect of propolis addition, brewing time and temperature on total phenolic content, antioxidant activity and sensory properties of cascara

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Abstract

The processing of coffee cherries into coffee beans produced a lot of residues, particularly coffee pulp, which can be further valorized to produce valuable bioproducts, one of which is Cascara. This study was carried out to model the effect of propolis supplement as well as brewing time and temperature on the total phenolic content and antioxidant activity of cascara. An organoleptic test was also carried out to determine the sensory properties of Cascara. Cascara had a higher total phenolic content when brewed using a hot brew method. Increasing the brewing temperature from 70 to 90 °C reduced the antioxidant activity while increasing brewing time from 4 to 8 min increased the total phenolic content of Cascara. The optimal conditions for brewing Cascara based on the developed regression model were hot brewing at 77 °C for 8 minutes without additional propolis, with an antioxidant activity IC_{50} and total phenolic content of 432.87 ppm and 2.07%, respectively. The addition of propolis caused a decrease in the antioxidant activity and total phenolic content, of Cascara. Based on the results of the organoleptic test, the panelists preferred Cascara that was brewed without the addition of propolis because it had a fresher, sour taste.

Keywords: antioxidant activity, cascara, total phenolic content, organoleptic test and propolis.

[ID-41]
Optimization of maceration conditions for ethanolic extract of *Moringa oleifera* leaves applying Box-Behnken design of experiment

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Abstract

In this study we employed ethanol-based maceration process, coupled with Box-Behnken design and response surface methodology to optimize the flavonoid extraction. The ethanol concentration (50–90%), temperature (40–60 °C), and time of extraction (2–6 h) were chosen as the conditions studied, while the yield percentage of extract and total flavonoid content were considered as the response variables. Proximate analysis of *M. oleifera* leaf samples showed that carbohydrates, fiber, and protein were the main constituents, respectively as much as 42.2%, 14.7%, and 2.4% (in wet basis). The constructed models showed a good fit to the obtained experimental data, with R^2 value of 0.992 for the yield percentage of extract and 0.974 for total flavonoid content. Based on the optimization model, extraction using ethanol with concentration of 53.5%, 67.3 °C, and 3.7 h were the optimum conditions, resulting in an extraction yield of 27.6% wt. In addition, the ethanol concentration of 80.9%, 60.3 °C, and 6.0 h were regarded as the conditions to achieve the optimum total flavonoid content of 5.05 g QE/100 g extract. Still, these conditions should be further tested on the higher scale of the extraction process and will therefore remain the focus of our following works.

Keywords: ethanolic extract, flavonoid, maceration, *Moringa oleifera*, response surface methodology

[ID-42]
Recovery of ammonium nitrogen from urea fertilizer plant wastewater using struvite crystallization stirred tank reactor modification

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Abstract

Struvite crystallization ($NH_4MgPO_4.6H_2O$) was studied on stirred tank reactor (STR) from recovery urea fertilizer plant wastewater. This method is by chemical adding of magnesium chloride hexahydrate ($MgCl_2.6H_2O$) and potassium dihydrogen phosphate (KH_2PO_4) to the wastewater as source ammonium nitrogen (NH^{4+}-N = 466.73 ± 6.31 mg/L) were first applied at the stoichiometric ratio (Mg^{2+}:NH^{4+}–N:PO_4^{3-}= 1:1:1) and at different pH levels ranging from 6.97 to 8.5, precipitate crystals at the bottom of the reactor after the crystallization reaction, separating crystals through a solid-liquid separation process, and drying the crystals. The operating process for 5 hours was carried out with flow rates of 22, 30, 45, 60, 90 L/h, and an impeller speed of 80 rpm. From this process, the NH^{4+} -N removal was 77 ± 1.54 % from the NH^{4+}-N concentration of 466.73 ± 6.31 mg/L, and the struvite yield 132.72 to 157.72 g/L. The scanning electron microscope (SEM) and X-ray diffraction (XRD) results further confirmed that the crystal recovered from urea fertilizer plant wastewater contained struvite crystal.

Keywords: Recovery urea fertilizer plant wastewater, stirred tank reactor, NH^{4+} -N removal struvite crystal

[ID-43]
The immune system of the decomposer insect *Hermetia illucens*

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Abstract

Hermetia illucens larvae, better known as black soldier fly, are decomposer insects that can reduce organic waste. Even, they convert it into protein and body fat that can be used as animal feed. Despite being in a pathogenic environment, *Hermetia illucens* can live and reproduce well. Allegedly, these insects have an efficient immune system. In general, insects have a cellular and a humoral immune system in dealing with pathogens and foreign objects that enter their bodies. This study aims to observe various types of hemocyte cells and their compositions that can play a role in the cellular immune system. Also, to examine the activity of the phenoloxidase enzyme in hemolymph which plays a role in the humoral immune system. Observations of various types of cells were carried out by observing the cells directly under a microscope and showed that there were 2 most dominant types of cells. Observation of the phenoloxidase enzyme was carried out by comparing its activity when treated with *Bacillus cereus* and showed a difference in the activity. From the research conducted, it can be concluded that *Hermetia illucens* has a cellular and a humoral immune system that can support its survival in a pathogenic environment.

Keywords: *Hermetia illucens*, black soldier fly, hemocyte, phenoloxidase, insect immune system

[ID-44]
The effect of acetic acid/formic acid pulping on pulp properties of empty fruit branches

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Abstract

In this study, we explore the pulp and handsheet properties of the inner and outer parts of empty fruit bunches (EFBs). Using a laboratory digester, three different ratios of pulping conditions (AcOH85/FA15, AcOH75/FA25, and AcOH65/FA35) were used. The results show that the pulp and handsheet properties were enhanced with acetic acid addition (up to an 85% concentration) and formic acid (concentration of <35%). Of these two parts, the inner part of EFB was slightly superior to the outer part because of its higher density, better formation, air permeability, as well as good tensile and resource-conserving technology properties. The pulping condition with the AcOH75/FA25 ratio was reported to offer sufficient yield, kappa number, and strength properties.

Keywords: EFB, inner part, outer part, acetic acid, formic acid, pulping, handsheets

[ID-45]
Optimization of culture medium for bacteria cellulose production using *Komagataeibacter intermedius*

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Abstract

Komagataeibacter intermedius is a potential bacteria that is rarely studied for its ability to produce bacterial cellulose (BC), a desirable polymer with many applications. This study is focused on exploring different strategies in improving the bacterial cellulose (BC) yield using *Komagataeibacter intermedius* cultured in sugarcane molasses. Specifically, the effect buffer as well as yeast addition to the fermentation medium on BC yield were investigated. The bacteria and yeast were cultivated in molasses medium with acetate buffer and compared with the non-buffered medium. The result showed that the BC production was increased from 0.3±0.1 g/L in media without the buffer to 1.8±0.1 g/L in the media with acetate buffer. Buffered media turned the pH of final fermentation from mildly acidic (pH ~5) to basic (pH 9). The presence of the yeast slows down the pH increases, allowing the bacteria to survive longer in the medium.

Keywords: bacterial cellulose, *Komagataeibacter intermedius*, *Dekkera bruxellensis*, fermentation optimization, buffered media

[ID-46]
Effect of shipping container modification and different types of packaging system on banana quality after transportation simulation

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Abstract

Product rejects during transportation using motorcycles is a problem in online grocery. The deterioration products are caused by several factors: temperature rises, ethylene accumulation in the container, and mechanical damage-this paper deals with how each causing factor affects a banana. Furthermore, a trial to reduce the deterioration by applying a modified atmosphere storage (MAS) system is done Three types of MAS treatments have been tested: applying a cooling agent, using $KMnO_4$ as an ethylene scavenger, and packed the product using several materials. The experiment shows that an ice pack could lower and maintain the temperature inside the container, which opened every 20 minutes, to 22°C for 3 hours and keep the products' quality. $KMnO_4$ usage as an ethylene scavenger could also keep banana quality from deteriorating. It is also observed that packaging using double corrugated paper gives a better performance than using plastic bags. Furthermore, adding coconut husks to the packaging could decrease mechanical damage risk by 70%. The study has shown that each MAS treatment had positive impacts on keeping the product quality.

Keywords: Banana. Shipping Container, Temperature, Ethylene scavenger, Packaging

[ID-47]
Kinetic model of phytochemical compounds extraction from *Orthosiphon aristatus* using hydrothermal method

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Abstract

Orthosiphon aristatus is a medicinal plant growth mainly throughout the Indian Subcontinent, southern China, Southeast Asia, and tropical Queensland. Method to extract the bioactive compounds from *Orthosiphon aristatus* is an important role in the development of pharmaceutical products. Hydrothermal extraction is one of the environmentally-friendly extraction methods. In this work, phytochemical compounds from *Orthosiphon aristatus* was extracted using hydrothermal method at various temperatures of 120°C to 160°C, constant flowrates of 4.5 ml/min, and constant pressure of 3 MPa. The extracted compounds were analyzed as phenolic and flavonoid compounds. The highest total phenolic compound (TPC) and flavonoid contents were 130.25 mg GAE/g sample and 195.80 CAE/g sample, respectively, obtained at temperature of 160°C. The highest extraction yield was also obtained at temperature of 160°C with 38.71% of extraction yield.

Keywords: *Orthosiphon aristatus*, Hydrothermal Extraction, Phenolic Compound, Flavonoid Compound, Kinetic Model

[ID-48]
Correlation of microclimate with the concentration of caffein and chlorogenic acid in robusta coffee from five different cultivation areas in West Java

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Abstract

Caffeine and chlorogenic acid (CGA) are two compounds that play a role in determining the quality of coffee. The amount of the two compounds may vary depending on the environment in where they are grown.The aim of this study was to determine the correlation between microclimatic factors of five different cultivation areas in West Java Indonesia, (i.e., Ciamis, Tasikmalaya, Sumedang, Kuningan, and Bogor) and concentration of caffeine and CGA in green and roasted beans of Robusta coffee. The green beans and roasted beans from the five areas were extracted with 70% methanol for caffeine analysis and they were extracted with ethyl acetate for CGA analysis. Caffeine and CGA were analysed by UV-HPLC (with HPLC operation condition use; C18 column diameter 4.6 mm, length 25 cm; eluent methanol:water 50:50 v/v; λ 272 nm for caffeine analysis; λ 324 nm for CGA analysis). The correlation between the microclimates factor and the amount of both caffein and CGA was determined by Principal Component Analysis (PCA) using Eigenvalue and Eigenvector. The PCA showed that the most influential microclimatic variables were altitude, rainfall, and humidity for caffeine concentration with 41.6% (PC1) of the total variance, while the most influential microclimatic variable were altitude, temperature, and humidity for CGA concentration with 46% (PC1) total variance. In conclusion quantity of caffeine and CGA are influence by microclimatic variables, particularly humidity, temperature, rainfall, and altitude. Caffeine concentration is significantly affected by rainfall, while CGA concentration is significantly affected by temperature.

Keywords: Coffee, Caffeine, Chlorogenic acid, UV HPLC

[ID-49]
Hydrolytic enzyme producing bacteria from the gut of *Oryctes rhinoceros* larvae inhabiting household waste composter

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Abstract

Oryctes rhinoceros which has been known as a pest on coconut trees has a relatively shorter adult phase than the larval stage. The larval stage of this organism lives in piles of organic matter, including in piles of household waste. The ability of larvae to utilize organic matter in their environment is inseparable from the role of potential microbes that produce enzymes associated with their gut. This study aims to isolate, screen, and identify the potential bacteria in producing hydrolytic enzymes from the gut of *O. rhinoceros* larvae. The third instar larvae were dissected aseptically to obtain gut bacterial isolates. The isolates were tested for their ability to produce amylase, cellulose, lipase, and protease using agar plates containing specific substrates. There were eight different isolates, and three of them had the ability to produce all four enzymes. The three isolates were identified as *Bacillus*. These results can be used as a reference for handling household organic waste.

Keywords: *Bacillus*, gut bacteria, hydrolytic enzymes, *Oryctes rhinoceros*, solid waste

[ID-50]
Isolation of active compounds from propolis produced by stingless bees cultivated in a monitored environment using a soxhlet extraction method

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Abstract

Precision farming is known as an information and technology-based farm management system that aimed for optimum productivity, profitability, and sustainability by minimizing the production cost. By designing an instrumentation system, beehive innovation called MOTIVE can be optimized. This research compares three stingless bees; *Tetragonula laeviceps*, *Tetragonula biroi*, and *Tetragonula drescheri*, to find the most effective propolis against microbes. This study analyzed propolis productivity, bioactivity concentration and antimicrobial activity. In this study, propolis productivity for *Tetragonula laeviceps*, *Tetragonula drescheri*, and *Tetragonula biroi* were 1.79±0.74, 1.86±0.18, and 2.47±0.15 gram/colony/week, respectively. The phenolic content of the propolis extract of *T. laeviceps*, *T. biroi*, and *T. drescheri* were 136.48±13.9, 104.09±3.86, and 117.15±2.34 mg GAE/gram, respectively, while the flavonoid content were 20.12±0.95, 5.1±0.04, and 7.93±0.19 mg QE/gram, respectively. The research shows that propolis productivity positively correlates with the body size of the stingless bee. GC-MS test result showed that component of the proposed propolis contains antimicrobial properties. The hive can be further optimized based on the collected data by implementing a control system to provide a preferred environmental microclimate.

Keywords: precision farming, instrumentation, MOTIVE, propolis, antimicrobial

[ID-51]
The effect of totally chlorine free bleaching on kenaf bast pulp properties

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Abstract

This paper presents the results of multi-stage peroxyacetic acid bleaching of kenaf bast pulp. Soda-anthraquinone (AQ) kenaf bast pulp (ISO brightness 48.77% and kappa number 7.9) was bleached by multi-stage peroxyacetic acid bleaching as Totally Chlorine Free (TCF) bleaching. Bleaching was conducted via several sequences with an initial chelating stage. The effects of temperature, retention time, chemical charges, alkalinity, and peroxide-acetic acid ratio were investigated to improve brightness and strength, and reduce effluent load, kappa number, and viscosity loss. Furthermore, handsheets were manufactured from bleached kenaf bast pulp, and the optical properties and strength were analyzed. These studies indicated that adding acetic acid reduced the chemical oxygen demand (COD) and turbidity. In enhancing the effluent properties, acetic acid also improved the strength and bleachability of handsheets.

Keywords: TCF bleaching, peroxide, acetic acid, peroxyacetic acid, kenaf bast pulp

[ID-52]
Amelioration of diabetes parameters treated with mixture of andrographolide and gallic acid in rats model and in silico affirmation

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Abstract

Common treatments for the management of diabetes have limitations due to side effects, hence the need for continuous research to discover new remedies with better therapeutic efficacy. Previously, we have reported that the combination treatment of gallic acid (20 mg/kg) and andrographolide (10 mg/kg) for 15 days demonstrated synergistic hypoglycaemic activity in the streptozotocin (STZ)-induced insulin deficient diabetic rats. Here, we attempt to further elucidate the effect of this combination therapy at the biochemical, histological and molecular level. Our biochemical analyses showed that the combination treatment significantly increased the serum insulin level and decreased the total cholesterol and triglyceride level of the diabetic animals. Histological examinations of H&E stained pancreas, liver, kidney and adipose tissues of combination-treated diabetic animals showed restoration to normalcy of the tissues. Besides, the combination treatment significantly enhanced the level of glucose transporter-4 (GLUT4) protein expression in the skeletal muscle of treated diabetic animals compared to single compound treated and untreated diabetic animals. The molecular docking analysis on this interaction will also be reported in this study. Taken together, these findings suggest the combination of gallic acid and andrographolide as a potent therapy for the management of diabetes mellitus.

Keywords: Gallic acid, Andrographolide, Diabetes, Combination therapy

[ID-53]
Anti-inflammatory and anticancer activity of sea cucumber compounds as NFκB inhibitor

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Abstract

Marine organisms such as sea cucumber have a high economic value and potentially have bioactive products as anti-inflammatory and anticancer. The study aimed to analyze the potential of sea cucumber compounds as anticancer in inflammatory target proteins NFκB. The 3D structure of NFκB was obtained from Protein Data Bank, 3D sea cucumber peptide structures were modeled, and 3D sea cucumber compound structures were obtained from the PubChem database. The protein NFκB was then docked with sea cucumber compounds using AutoDock Vina software. The docking results showed that WNWKL and Scabraside D bound to the active site of NFκB in a similar position with CAPE (control). The potential ligands prediction showed that the peptide WNWKL and Scabraside D play a role as anticancer. It is concluded that peptide WNWKL and Scabraside D from sea cucumber can potentially act as inhibitors of cancer cells.

Keywords: marine product, cancer inhibitors, holothurian

[ID-54]
Development of an Agrotechnopark at Bukit Sandy, Bandung

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Abstract

Sustainable development is development based on the consideration of the needs of present and future generations by applying ecological approach, economic, social, and technological dimensions to achieve sustainability. Sustainable development of agricultural areas must consider the aspects of continuity, quality, and quantity. Development of an agrotechnopark can be a good alternative for the hub of various technologies related to agriculture and post-harvest processing as well as a training center and center for technology transfer to a wider community. This study aimed to develop an agrotechnopark at Bukit Sandy, Mekarsaluyu District, Bandung Regency that apply an integrated farming system and biorefinery concept. Citrus (*Citrus reticulata* var. RGL) and asparagus (*Asparagus officinalis*) plants that already exist at Bukit Sandy were integrated with the cultivation of *Tetragonula Laeviceps* S., *Hermetia illucens* L., *Anas domesticus* L. and various hydroponic vegetable crops to produce various bioproducts that can increase the income of the farmers. The agrotechnopark will also be equipped with precision farming technologies as well as smart tour guide applications to facilitate and educate future visitors at the agrotechnopark. The design for future agrotechnopark at Bukit Sandy has been realized and the development is expected to be accomplished in less than five years.

Keywords: Agrotechnopark, Biorefinery, Integrated farming, Precision farming, Sustainability

[ID-55]
Factors behind variation in litter decomposition rates between two broadleaf secondary forests and pine forests in the Tropical Region of South Sulawesi, Indonesia

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Abstract

Litter decomposition is a major determinant of the nutrient cycling of most terrestrial ecosystems. The rate of litter decomposition usually varies between forest communities which is determined by several physical and biological factors. This study aimed to uncover, analyze and examine differences in the rate of litter decomposition on the forest floor between two secondary forest communities: Karst forest, Lowland forest and *Pinus merkusii* plantation forest in Maros, South Sulawesi, in relation to physical and biological factors. Large permanent plots were established in each forest community: 0.73 ha in Karst forest, 1.00 ha in Lowland forest, and 0.4 ha in pine forest. Ten small quadrants of 1 m x 1 m were established in each plot to observe the natural rate of litter decomposition on the forest floor. Just behind each quadrant, one litter trap measuring 1 m2 was placed to monitor litter production monthly. Data for this paper were collected from Dec 2018 to Dec 2019. The results showed that the mean litter decomposition rate for one year in Lowland forest (983.26 g/10m^2/year) and in Karst forest (910.97 g/10m^2/year) was significantly higher from Pine forest (502.15 g/10m^2/year), while no significant difference was detected between Lowland and Karts forests. The difference in rate of litter decomposition between forest communities is predicted to relate to species composition of each forest community which in turn determine the chemical composition of litter produced. In addition, the species diversity of macrofauna and microorganism as well as soil chemical properties were the major factor in determining the rate of decomposition in each forest community.

Keywords: Physical factors, biological factors, litter decomposition, macrofauna, microorganism

[ID-56]
Bio-management analysis for integrated cultivation stingless bees with citrus plantation at Bukit Sandy, Bandung

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Abstract

Tetragonula sp. or stingless bee is a well-known producer of propolis, one of Indonesia's potential natural resources that have a high economic value. Integrated cultivation of stingless bee with citrus (*Citrus reticulata* var. RGL) plantation may offers economic advantages to farmers. This study aimed to investigate the bio-management of integrated cultivation of stingless bee with citrus plantation at Bukit Sandy, Bandung. Availability of nectar, resin and pollen is very crucial to promote healthy bee colonies. Environmental aspects are also very important to ensure successful integration of stingless bee with citrus plantation. In addition, trained human resources that have adequate knowledge in the integrated farming system is also very critical. Aspects of human resources include the number of human resources and knowledge on cultivation of stingless bees meanwhile, environmental aspects include temperature and humidity, land area, and feed availability. The results showed that currently human resources in Bukit Sandy are very limited both in terms of numbers and knowledge about cultivation of stingless bees. Therefore, additional members and training are needed. Nevertheless, environmental conditions in Bukit Sandy such as temperature and humidity are suitable for the cultivation of stingless bees. In addition, the area has various vegetations apart from citrus plants that can provide the source of nectar, pollen, and resin to the bees throughout the year.

Keywords: Bio-management, citrus, stingless bees, propolis, integrated farming

[ID-57]
Development of a Bee Technopark in Bukit Sandy, Bandung

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Abstract

Tetragonula sp. (stingless bee) is one of the bees that are being widely cultivated by small beekeepers in Indonesia. Stingless bees have the advantage of producing more propolis and stingless as compared to *Apis* sp. (honeybees). However, this bee is not yet widely known by the public and less popular in comparison to the hone honeybees. One of the methods to introduce stingless bees to the public is through the development of a Bee Technopark concept. Bee Technopark is an educational tourism park that combines elements of knowledge about beekeeping which is facilitated with modern technology. This study aimed to determine the potential and strategy to develop a Bee Technopark at Bukit Sandy in Bandung. The results of the assessment of tourism objects and attractions show that tourist attractions, accessibility, conditions around the area, management, and services, as well as supporting facilities and infrastructure were categorized as feasible to be developed into tourist areas and at the exploration stage in the tourism area life cycle. In addition, vegetation and microclimate conditions were sufficient to support the survival of stingless bees. The community was also interested in learning about stingless bees and willing to participate in the development of a Bee Technopark in Bukit Sandy. Even so, the infrastructure and human resources for the cultivation of stingless bees are still not sufficient, so it is necessary to build infrastructure and human resources to transform Bukit Sandy as a commercial Bee Technopark.

Keywords: Bee Technopark, Edutourism, Stingless bee, Tourism, Vegetation

[ID-58]
Lipid content and morphology of *Skeletonema costatum* on nutrient N and Si stress

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Abstract

Skeletonema costatum is a diatom microalgae that can be used as one candidate for biodiesel because it has a TAGs 8% lipid content of dry weight with doubling time 0.340 cells/day. This study aims to determine the effect of N and Si nutrients on the lipid content and morphology of *S. costatum*. The method begins with a preliminary test of *S. costatum* culture with different concentrations of nutrient N and Si, then measured cell density with Haemocytometer for making growth curves. The observation parameters in this study included analysis of quantitative lipid content using the soxhlet method and qualitatively using fluorescence microscopy, and morphological observations of *S. costatum* using SEM. The design used was RAL and then analyzed using one way ANOVA ($\alpha = 0.05$) and continued by the Tukey test. The results showed that nutrient N and Si stress proved the lipid content and morphology of *S. costatum*. The less amount of nutrients N and Si in the growth media, the total lipid content of *S. costatum* increased, while the management of N3Si2 (10.25%) and N2Si2 (6.75%) differed significantly from the control (1.75%). The lipid content of TAGs was approved by the presence of a yellow color on N3Si2 administration. Morphological observations of *S. costatum* on the implementation of N3Si have changed the size of the *S. costatum* cell length, which is 3.9 µm 70% smaller than the normal size of the control 10.7 µm.

Keywords: Morphology, Skeletonema costatum, Stress Nutrient (N and Si), Total Lipid, TAGs

[ID-59]
Cultivation of black soldier fly larvae to produce fishmeal and fertilizer

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Abstract

Cultivation of *Hermetic illucens* or generally known as black soldier fly has receiving great attention worldwide because of its ability to convert organic matter into valuable bioproducts such as protein-rich biomass and fertilizer. The composition of black soldier fly larva may vary depending on cultivation period and the substrate provided during the cultivation stage. This study aimed to investigate the proximate composition of black soldier fly larva and prepupa when cultivated with commercial chicken feed for 12 days. The moisture content varies from 59.8 to 69.6% with protein content of 19.5 to 26.3%, fat content of 10.6 to 17.6% and carbohydrate content of 0.04 to 0.17%. The data shows that the protein and fat content of the larvae tend to increase up to day 10 before slightly decreased with increasing days of cultivation. After 12 days, the larvae have transformed into prepupae, and the proximate composition was also analyzed. The moisture content varies from 68.9 to 69.8% with protein content of 19.4 to 19.9%, fat content of 8.3 to 11.5% and carbohydrate content of 0.13 to 0.22%. Larvae that were still alive were immediate used as a fishmeal for goldfish and nile tilapia. The average growth rate of goldfish and nile tilapia after being fed with only the fresh larvae for 28 days was 0.24 grams/day and 0.55 grams/day. In addition, the solid and liquid residue from the larval cultivation stage was also analyzed to determine their prospect as organic solid and liquid fertilizer. The solid residue had a pH of 7.4 and contains 24.6% moisture, 36.1% carbon, 3.7% nitrogen, 1.7% phosphorus oxide and 1.4% potassium dioxide where the liquid residue has pH of 3.4 and contains 0.02% carbon, 0.04% nitrogen, 0.01% phosphorus oxide and 0.001% potassium dioxide.

Keywords: fat, fishmeal, growth rate, *Hermetic illucens*, protein

[ID-60]
Integrated cultivation of tomato with *Tetragonula laeviceps*

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Abstract

West Java has the largest tomato plantations in Indonesia, with a total area of more than 9000 ha and productivity of 28.8 tons/ha. The productivity of tomato in Indonesia is relatively lower as compared to other countries. The productivity can be increased with the help of stingless bee as a pollinating agent. This study aimed to investigate the effect of integrated cultivation of tomato with *Tetragonula laeviceps* at Cigelang plantation, Sumedang. Fifteen colonies of *Tetragonula laeviceps* were placed in a tomato cultivation site with an area of 210 m^2 and compared with another tomato cultivation site that was not integrated with the cultivation of *Tetragonula laeviceps*. Both sites have an area of 210 m^2 and no pesticide was applied during the cultivation process. Observations were made every two weeks to count the number of flowers and fruits. The weight of fruit and plants were calculated to be compared between the two sites. The productivity of the harvested tomato from the site with stingless bees was 1.5 times higher than the other sites. In addition, the tomato fruits harvested from the cultivation site that was integrated with the cultivation of *Tetragonula laeviceps* have higher vitamin C (599.5 mg/100 g) and lycopene content (816.4 ppm). The soil content was reported to be relatively similar between the two fields. Some considerable differences can be found in the total phosphor and potassium content. The treated field has more phosphor content and lowers potassium content than the non-treated field.

Keywords: lycopene, *Tetragonula laeviceps*, tomato, productivity, vitamin C

[ID-61]
Red kidney bean as soybean alternative in Tempeh milk powder processing with antioxidant properties

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Abstract

Red kidney bean (*Phaseolus vulgaris* L.) belongs to the *Fabaceae* family and contains high protein, fiber, calcium, and iron content. Red kidney bean can be used as substrate in tempeh fermentation to produce tempeh milk as a local plant-based milk designated for people who are lactose intolerant, allergic to milk, and vegan. The objective of this study was to investigate the effect of tempeh milk processing types using red kidney bean and soybean on the total phenolic content, antioxidant activity, and sensory properties of tempeh milk powder. Both types of beans were fermented into tempeh using commercial *Rhizopus* sp. mold and incubated for 36 h at room temperature. Tempeh was cut, blanched, and steamed or baked. Raw tempeh was used as a control. The processed tempeh was blended with water, filtered, added with a stabilizer, and pasteurized. Tempeh milk was then spray dried and the milk powder was sieved and analyzed for the protein content, total phenolic content, DPPH radical scavenging assay, and hedonic test. The crude protein content of tempeh milk powder from soybean was 2-fold higher than that of red kidney bean. The total phenolic content and the antioxidant activity of tempeh milk powder from red kidney bean was as high as that of soybean. Steaming the tempeh only reduced the antioxidant activity, while baking process reduced the total phenolic content and antioxidant activity of the tempeh milk powder. The heating temperature and time of tempeh affected the degradation of antioxidant compounds in tempeh, such as phenolics and peptides. Steamed tempeh milk was most liked by the panelist in all sensory attributes and red kidney bean tempeh milk was the second most liked milk after soybean tempeh milk. Red kidney bean could serve as soybean alternative to produce tempeh milk powder with medium antioxidant activity.

Keywords: baking, DPPH, phenolics, steaming, spray dry

[ID-62]
In vitro callus induction of *Plukenetia volubilis* (Sacha Inchi), a PUFA-Rich Plant

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Abstract

In vitro micropropagation through callus induction has been established on *Plukenetia volubilis*. Different treatments of 2,4-dichlorophenoxyacetic acid (2,4-D) and 6-benzylaminopurine (BAP) have influenced the propagation either incubated at 24 hours of light exposure or 24 hours in dark. The young leaves explants deemed promising in developing callus in media supplemented with both plant growth regulators of 0.1 mg L^{-1} 2,4-D + 0.05 mg L^{-1} BAP and 1.0 mg L^{-1} 2,4-D + 0.05 mg L^{-1} BAP. Interestingly, similar concentration was found to be the most suitable to induce callus from ovule which was MS media supplemented with 0.1 mg L^{-1} 2,4- D + 0.05 mg L^{-1} BAP in both light and dark conditions compared to the single use of 2,4-D. In addition, all other treatments also demonstrated callus induction from ovule. This is the first report attempted on using ovules as explant. The reported result shows intriguing possibilities for the utilization of sacha inchi's parts other than leaves as an alternative source of callus culture to scale up the micropropagation for pharmaceutical applications.

Keywords: in vitro, callus, sacha inchi, young leaves, ovules

[ID-63]
Ethnopharmacology, phytochemistry and toxicity activity of ten medicinal plant from Central Sulawesi

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Abstract

This paper is based on ethnopharmacological investigation at villagers in Center Sulawesi forest area. The method of study is conducted through in-depth interviews at local people. The phytochemical compound was qualitatively examined in the methanol crude extract included flavonoid, tannin, saponin, triterpenoid, steroid, hydroquinone, and alkaloid. The toxicity activity of the extract was based on Brine shrimp lethality test (BSLT). The active compound of several medicinal plants was conducted by gas chromatography mass spectra (GCMS). The result showed that there are ten important species of medicinal plant have collected. The local people used the medicinal plant for curing such as antidiabetic, anticholesterol, antihypertension, hemorrhoid; wound healing, hepatitis A medication, hepatitis B medication, heart medicine, nerve disorders medication, and typhus. The phytochemical testing showed that the extract contains flavonoid, saponin, tannin, terpenoid, and alkaloid. Furthermore, the toxicity activity (LC_{50}) showed that *Asystasia nemorum*, 403.33 ppm; *Gliricidia sepium*, 489.61 ppm; *Sida rhombifolia*, 298.39 ppm; *Blumea lacera*, 182.32 ppm; *Artemisia vulgaris*, 509.70 ppm; *Micromelum minutum*, 59.88 ppm; *Tabernaemontana pandacaqui*, 182.88 ppm; *Eleutherine bulbosa*, 608.32 ppm; *Adenanthera pavonina*, 418.94 ppm; and *Ruellia tuberose*, 418.35 ppm. One of the chemical compounds in an extract is phytol compounds. This compound has immunostimulants effect based on its ability to activate innate immunity, strengthen various antigen-specific immune responses, and produce immunological memories.

Keywords: Ethnopharmacology, phytochemical, toxicity, medicinal plant

[ID-64]
Optimisation of culture condition for Sacha Inchi (*Plukenetia volubilis*) callus induction

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Abstract

Plukenetia volubilis or commonly known as sacha inchi produces wide range of health-promoting bioactive compounds. The plant has large edible seeds that are rich in phenolics, minerals and essential fatty acid, such as omega 3, omega 6, omega 7 and omega 9. In vitro cultures could serve as an alternative in producing many essential sacha inchi bioactive compounds. In this study, as initial step towards initiating in vitro cultures, the effect of 2,4-D and TDZ on callus induction using leaves and male flower explants were investigated. Surface sterilization of the sacha inchi explants were done by using 70% ethanol (30 seconds) and 0.5% sodium chloride (8 minutes) to overcome culture contamination. The sterilization method resulted in 82.5% and 95% survival rate for leaf and flower explants, respectively. Next, for callus induction the explants were cultured on MS medium supplemented with different concentrations of 2,4-D and TDZ, either alone or in combination and grown in 24 hours dark photoperiods. The morphology and size of callus obtained varied according to the treatment. Callus produced are either friable or compact with either creamy white, pure white or brownish colour. For both explants, the best response in term of callus size, friability and creamy white callus was obtained when cultured on MS medium supplemented with 3% (w/v) sucrose in combination with 1.0 mg/L 2,4-D and 0.005 mg/L TDZ.

Keywords: Sacha inchi, callus, in vitro cultures, *Plukenetia volubilis*

[ID-65]
Formulation of sol-gel coating with addition of Spora *Bacillus* sp. and biosurfactant as an inhibition agent for the biocorosion of St-37 steel in sea water

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Abstract

Microbially influenced corrosion (MIC) is an association of the metabolic activity of microorganisms with metals. This type of corrosion can occur in power plants, as well as oil and gas industry pipelines, especially those in the offshore. In many industries, toxic biocides are used as a step to deal with MIC. Corrosion inhibiting biofilms and biosurfactants are potential environmentally friendly alternatives. In this study, aerobic bacteria *Bacillus* sp. in the form of spores and biosurfactants as corrosion inhibiting agents. To increase its effectiveness, a sol-gel coating encapsulation technique is used, which is also known to prevent corrosion. This study aims to determine the formulation and the effect of the addition of biosurfactants and bacterial spores on the solgel coating on biofilm formation and the corrosion resistance level of ST-37 steel incubated in seawater. In addition, a spore viability test was performed to ensure that the spores were able to germinate in the sol-gel. Analysis of the formation of biofilms was carried out by the ALT method, while the level of corrosion resistance was by the EIS method. The sol-gel formulation consisted of TEOS: GPTMS: PDMS-amino of 10: 6: 4 (v / v) with an aging time of 8 hours. The viability of the spores of Bacillus sp. in the sol-gel system by 90.15%. Addition of biosurfactant to sol-gel can reduce the amount of biofilm formed. Whereas the addition of spores increases the amount of corrosion inhibiting biofilm formed. Based on the results of the EIS, there was an increase in the impedance value in the sol-gel treatment compared to the negative control. The impedance is increased with the addition of biosurfactant, which is 6736,485 Ω cm^2. Impedance of spore encapsulated sol-gel shows a lower value, which is 3460,518 Ω cm^2. From the results of the study it can be concluded, that the sol-gel with the addition of surfactants is more effective in inhibiting the formation of biofilms and biocorrosion of ST-37 metals.

Keywords: biofilms, biosurfactants, sea water, sol-gels, *Bacillus* sp.

[ID-66]
Pregnancy outcome and mammary development of gravis mice treated with ethanolic extract of bitter melon (*Momordica charantia*) leaf

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Abstract

Bitter melon (*Momordica charantia*) leaf has long been known as natural remedy in many regions. In has a good nutritional value, high in vitamins and minerals. Some studies, however, reported that it also has anti fertility effects. This study was conducted to evaluate the effects of ethanol extract of bitter melon leaf on pregnancy outcome and mammary gland development in conceived mice. The conceived mice as indicated by the vaginal plug formation were treated with bitter melon extract orally at the concentration of 0mg.kg^{-1}, 750mg.kg^{-1}, 1000mg.kg^{-1}, and 1250mg.kg^{-1} BW daily starting from vaginal plug formation up to day 18th of pregnancy. Data collections were conducted on day 6th, day 12th, and day 18th of pregnancy. The results showed that the bitter melon leaf extract has no effect on the implantation success ($p>0.05$) nor fetus size and fetus morphology. The bitter melon leaf extract suppressed mammary gland development during early pregnancy ($p<0,05$) as indicated by the gland's volume but it has stimulatory effect on late pregnancy. Histological examination showed an increased in branching of lactiferous ducts and alveolar area of the mammary glands. These results indicating that the bitter melon leaf extract has no adverse effect on pregnancy in the mouse.

Keywords: fetus development, implantation, mammary gland, *Momordica charantia*, pregnancy outcome

[ID-67]
Identification and characterization of plasma protein types of Covid-19 patients that have been confirmed negative PCR for <1 month with SDS-PAGE method

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Abstract

Covid-19 is a disease that emerged at the end of 2019 until it became a worldwide pandemic. No effective drug has been found against the Sars-Cov-2 virus to treat patients who are still infected with the virus. However, several ways can be used to increase the immunity of Covid-19 patients who have severe symptoms, one of which is Convalescent Plasma therapy. This study aims to determine what types of proteins are contained in plasma in Covid-19 patients who have been declared cured for <1 month. This type of research is qualitative research. The population in this study was 15 people and the sample used was 9 people who had recovered from Covid-19 for <1 month. The results showed protein bands with different molecular weights of 160 kDa; 104 kDa; 94 kDa; 80 kDa; 68 kDa; 55 kDa; 32 kDa; 28 kDa; 27 kDa; 15 kDa; 10 kDa and 9 kDa. Estimates of each of these molecular weights are IgG, IgM heavy chain, and Fab IgG which belong to the adaptive immune system group, as well as IL-8, IL-10, IL-16, IL-17, IL-23, IFN, and TNF-α which belongs to the group of cytokine types. It can be concluded that there are types of proteins that play a role in the specific (adaptive) immune system and various types of cytokines. This research should be continued by using the computational sequencing method.

Keywords: Covid-19, Types of Protein, Convalescent Plasma, Immune System, SDS-PAGE

[ID-68]
The effect of endophytic bacteria *Bacillus amyloliquefaciens* and *Bacillus subtilis* on changes the composition of sugar post-harvest of Cilembu Sweet Potato (*Ipomoea batatas* L. var. cilembu)

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Abstract

Cilembu sweet potato is one of the superior varieties of sweet potato, which originated from Cilembu Village, Sumedang, West Java, Indonesia. During storage, starch degradation by enzymes in both plants and its endophytic bacteria causes changes in the sugar contents. In this study, we report the diversity of endophytic bacteria in sweet potato during five weeks of storage and the contribution the endophytic bacteria in the changes of starch and sugar composition of cilembu sweet potato. These information could showed how the contribution of endophytic bacteria in terms of sweet taste in cilembu sweet potato. The isolation of endophytic bacteria in Cilembu sweet potato during five-week storage period showed total bacterial abundance of 7.15x104-2.77x105 cfu/g, with the density of amylolytic bacteria reached 5.4x104 cfu/g. There were eight endophytic bacteria isolates exhibiting activities of amylase, which hydrolyze starch during storage. These isolates include *Bacillus subtilis*, *B. mojavensis*, *B. megaterium*, *B. licheniformis*, *B. amyloliquefaciens*, *B. mycoides*, *B. safensis* and *Staphylococcus haemolyticus*. In this study, it is confirmed that the inoculation of endophytic bacteria *B. subtilis* and *B. amyloliquefaciens* before storage changes the composition of sugar during storage of Cilembu sweet potato. Changes occurred were observed in glucose and fructose level increase (2.12% and 1.62% respectively), achieved after one week of storage, faster than control samples (without bacterial inoculation, 1.58% of glucose and 1.12% of fructose after four weeks of storage). These increases occurred along starch and sucrose decreases in the inoculated samples.

Keywords: Amylase, enzymes, fructose, glucose, starch

[ID-69]
Comparison of cassava major diseases occurrence between sweet and bitter cultivars in Regency of Gunungkidul, Special Region of Yogyakarta

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Abstract

Classification of sweet and bitter cassava based on its HCN content might contribute to difference in physiological responses against disease infection. This study was aimed to investigate the comparison of disease occurrence between several cultivars of bitter and sweet cassava cultivated in Regency of Gunungkidul. This study was carried out through field survey in several areas in Gunungkidul where samples were selected using purposive sampling based on the cultivars. Five cultivars representing both bitter and sweet cassava were used. Incidence and severity of cassava major diseases (cassava bacterial blight, diffuse leaf spot, and brown leaf spot) was thoroughly observed from those selected cultivars were each cultivars was represented by 18 plants. Statistical analysis was performed using a one-way analysis of variance and the significance among cultivars was further assessed using DNMRT with a $p<0.05$. Results showed that 100% incidence of cassava bacterial blight and brown leaf spot were recorded in both sweet and cassava cultivars. However, of 10 cultivars observed, Ketan Merah conferred low incidence of diffuse leaf spot. Based on the disease severity, most of bitter cassava cultivars showed higher susceptibility against bacterial blight and brown leaf spot. In contrast, the severity of diffuse leaf spot was varied among all cultivars observed. The results of this study highlighted that the disease resistance of these cassava cultivars might be correlated with its HCN content.

Keywords: bitter cassava, sweet cassava, bacterial blight, brown leaf spot, diffuse leaf spot

[ID-70]
The effect of coffee skin waste (*Coffea* sp.) with ammoniation process as alternative feed mixture on growth, feed conversion, and meat quality of Cobb Broiler Chicken

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Abstract

The high cost of feed remains an issue to stock farmers. Industrial waste can be utilized as a feed ingredient due to its relatively cheaper price. Indonesia produced 642.000 tonnes of coffee in 2020. Coffee skin constitutes one of its production processes and contributes to 40% of coffee's fruit weight. This makes coffee as a feed ingredient alternative for broiler chicken. The high fiber content in coffee skin entails additional processing, namely ammoniation. This research aims to determine the effect of different percentages of coffee skin flour mixture in broiler chicken feed to the values of Initial Body Weight (IBW), Final Body Weight (FBW), Weight Gain (WG), Daily Weight Gain (DWG), Average Daily Gain (ADG), Relative Growth Rate (RGR), Relative Consumption Rate (RCR), Feed Conversion Ratio(FCR), Efficiency Conversion Digested(ECD), and the quality of meat content. Cobb broiler chicken farming is carried out for 35 days in SITH ITB Educational Garden in Haurngombong, Sumedang Regency. The data obtained is analyzed using IBM Statistic 26. The results show that mixing coffee skin flour to commercial feed does not give different value results in Initial body Weight and Final Body Weight, Weight Gain, Daily Weight Gain, Average Daily Gain, and Relative Consumption Rate than if the chicken were given their usual feed (control condition). However, mixing coffee skin flour with commercial feed has significant effects on Relative Growth Rate value, as shown by the significant difference in values between P0 and P1, P2, and P4, as well as P2 and P3. Moreover, the results also show there is a slight difference in fiber content between the mixed feed with SNI stipulations on feed contents. We also found no significant difference between the treatment to the values of Feed Conversion Ratio and Efficiency Conversion Digested. Lastly, the treatments that give the best proximate result on the chicken meat are found in P2 for water content, P4 for ash content, P1 for protein content, P0 for fat content, and P0 for gross energy/100 grams.

Keywords: Cobb broiler chicken, Meat, Conversion, Feed

[ID-71]
Production of propolis and honey by *Tetragonula laeviceps*

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Abstract

Productivity of propolis and honey produced by *Tetragonula laeviceps* is influenced by the size of the hive. This study aimed to investigate the effect of hive size to the productivity of propolis when *Tetragonula laeviceps* were cultivated using *Modular Tetragonula Hive* in Jatinangor, West Java, Indonesia. Each hive was equipped with a mesh of different materials. The results obtained in this study showed that increasing hive's size increases the productivity of propolis with the highest productivity of propolis was obtained when *Tetragonula laeviceps* was cultivated in large hives equipped with a nylon-based mesh. The productivity of honey was also determined with the highest productivity of honey was obtained when *Tetragonula laeviceps* was cultivated in medium hives equipped with an aluminium-based mesh. The total flavonoid and phenolic content of the propolis extract as well as important properties of the honey have been determined and shows promising values.

Keywords: hive, honey, *Tetragonula laeviceps*, mesh, productivity

[ID-72]
A review on stingless bees as pollinators for agricultural crops

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Abstract

Insects play very important role in an ecosystem, one of which is as a pollinator. Wild insects in agricultural crop ecosystems can help pollinate flowers, but the availability of these wild insects often needs to be supported by cultivated pollinator insects. Stingless bees (*Hymenoptera: Apidae*) are insect pollinators commonly found in tropical and subtropical countries that do not have a stinger and can produce honey and propolis. They are relatively small and easy to cultivate as compared to the honeybees (*Apis* spp.). This study aimed to provide a review about stingless bees as pollinators. The application of stingless bees as pollinators has been widely carried out in the Asian and Australian continents, both in open and closed system agriculture. Stingless bees can increase fruit productivity because the percentage of fruit and seed formation increases in crops of various commodities such as blueberry (*Vaccinium corymbosum*), chili (*Capsicum annum*), cucumber (*Cucumis sativus*), raspberry (*Rubus idaeus*), rockmelon (*Cucumis melo*), sunflower (*Helianthus annuus*), watermelon (*Citrullus lanatus*), and thorny palm (*Salacca* sp.). Further research can be carried out to integrate the cultivation of stingless bees with agricultural crops to increase to create a sustainable agricultural crop ecosystem.

Keywords: Agriculture, Ecosystem, Pollinator, Productivity, Stingless bee

[ID-73]
Effect of drying on the yield of essential oil extracted from the peel of Rimau Gerga Lebong

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Abstract

Rimau Gerga Lebong is one type of orange fruits that have a content of vitamin C derived from the cross pollination between Jeruk Manis (*Citrus sinensis* Osbeck) and Jeruk Keprok (*Citrus reticulta* Blanco) originating from Bengkulu, Sumatera, Indonesia. The fruit is often consumed but the peel is often discarded. The peel contains a considerable amount of essential oil that can be extracted to produce a bioproduct with a higher economic value. This study aimed to determine the effect of drying on essential oil yield and diffusion coefficient when orange peel was extracted using a hydro distillation method. An essential oil yield of 0.35% was obtained when fresh orange peel was used as an input for the hydro distillation method. When the peel was shade drying for 10 days, the yield experienced an increase of 429% to 1.85%. The diffusion coefficient of the extraction process also has been determined as 1.6×10^{-6} m^2/s.

Keywords: diffusion coefficient, drying, hydro distillation, orange, Rimau Gerga Lebong, yield

[ID-74]
Drying of Vanilla (*Vanilla planifolia* Andrews) in a simple drying system with incandescent light treatment and air circulation

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Abstract

Vanilla (*Vanilla planifolia* A.) is a tropical plantation plant that has many uses, 60% is used in the food sector, 33% is used for cosmetic needs, and 7% is used for aromatherapy. Vanilla has a high economic value because it's one of the most expensive spice products in the world. The post-harvest process of vanilla consists of sortation, killing, sweating or fermentation, drying, and conditioning. Drying is an influence process in determining the quality of vanilla. Mostly the farmers still use the traditional way, by drying vanilla under the sunlight. Drying traditionally still depends on weather conditions, so it takes a long drying time and the quality is difficult to standardize. Therefore, a study of vanilla drying was carried out using a simple drying device with incandescent light and air circulation, which then determined the most optimal fan voltage and drying load capacity of the dryer. In addition, the specific energy consumption (SEC) value, the energy efficiency value, the effective diffusivity coefficient value, the activation energy value, the vanillin content and ash content of drying results, and mathematical model of drying are determined in this research work.

Keywords: drying, incandescent, moisture content, vanilla, vanillin

[ID-75]
Drying Vanilla (*Vanila planifolia* Andrews) using infrared heat and air circulation

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Abstract

Vanilla drying is very important in flavor formation. This study aims to evaluate the drying process of vanilla using a simple dryer equipped with infrared lamps and air circulation. The 9 months vanilla which has been through the withering and curing process is dried using an infrared dryer. Experiments were carried out with a one-variable-at-a-time (OVAT) design with two test variables, namely fan voltage (4V, 6V, and 8V) and drying capacity (1 tray, 2 trays, and 3 trays) carried out in triple. The evaluation of the drying process was reviewed based on the evaluation of the system and the drying results. The evaluation of the drying system includes the specific energy consumption (SEC) value, activation energy, and energy efficiency, while the evaluation of the drying results includes physical and chemical characteristics. The results showed that the increase in fan voltage did not have a significant effect on drying vanilla. Furthermore, the drying capacity influences the efficiency of the dryer and the specific energy consumption (SEC) where a large capacity will increase efficiency and decrease the SEC value. The mathematical model that describes the drying characteristics of vanilla is Wang- Singh. When viewed from the evaluation of the results of drying, it is found that vanilla that is dried with an effective voltage and capacity for 6 days can reduce the moisture content to 37.248% and produce a vanillin content value of 3.12% and an ash content of 2.25%.

Keywords: Efficiency, Infrared, Drying, Diffusivity coefficient, SEC, Vanilla

[ID-76]
Measurement of isobaric vapor-liquid equilibrium, data correlation and prediction for methanol - glycerol system at 61.3 and 100.8 kPa

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Abstract

Glycerol purification from the unreacted methanol should be conducted to ensure its quality and purity. Vapor-liquid separation is a process that is often used in purification. Therefore, vapor-liquid equilibrium (VLE) data are needed. The isobaric binary VLE data of the methanol and glycerol system were conducted in this study. The experiment were used modified Glass Otmher-Still apparatus at 61.3 and 100.8 kPa. Each liquid and vapor phase composition at equilibrium were analyzed using Bausch and Lomb ABBE refractometer index. The thermodynamic consistency test were determined using the L-W method. From the correlation results, it shown that the experimental data were well correlated with Wilson, NRTL and UNIQUAC thermodynamic models with highest average absolute deviation (AAD) in temperatures and vapor compositions were 0.21% and 0.04%, respectively. The ability of UNIFAC model to predict the VLE system studied as well.

Keywords: phase equilibrium, methanol, glycerol, NRTL, Wilson, UNIQUAC, UNIFAC

[ID-77]
Bioassay-guided isolation of α-glucosidase inhibitor from Katuk (*Sauropus androgynus* Linn.)

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Abstract

Diabetes is a global health problem and Indonesia is the 7th in the list of countries with the highest case of diabetes, with approximately 13 million people are predicted to suffer from diabetes by 2030. Hyperglycemia (high blood sugar) in diabetes can be controlled using α-glucosidase inhibitors, which recently are still limited to voglibose, acarbose, and miglitol. However, those inhibitors have been reported to cause unwanted gastrointestinal side effects and efficacy problems in the health care system. Other safer, more effective inhibitors are still needed to be explored, especially from potential natural sources. *Sauropus androgynus*, also now as Katuk in Indonesia, has been traditionally used as a lactagogue and green diabetic treatment. Unfortunately, the compounds from the plant that are responsible for the antidiabetic property are still unknown. This research aims to isolate and elucidate the structure of chemical constituents which show activity. Katuk leaves were extracted by maceration using ethanol 70% then fractionated by liquid-liquid extraction using n-hexane and ethyl acetate. Three fractions were obtained and were screened for α-glucosidase inhibitory activity. The highest activity was found in the ethyl acetate fraction, which was continued for further separation using vacuum liquid chromatography. Compound FE-SA-01 (110 mg) was successfully isolated and purified using radial chromatography. The structure elucidation of the compound was done using spectroscopic methods (UV, IR, and NMR), and was identified as astragalin. The compound demonstrated α-glucosidase inhibitory activity with IC_{50} of 55.3 ± 0.61µg/mL. The IC_{50} value was lower compared to that of acarbose (positive control) which was 162.96 ± 0.59 µg/mL, indicating a potential use of astragalin as an α-glucosidase inhibitor. The results suggested that astragalin is one of the compounds responsible for the antidiabetic property of Katuk and this is the first report of astragalin in *Sauropus androgynus*.

Keywords: astragalin, cekurmanis, flavonoids, glucosidase inhibitor, katuk, *Sauropus*, *Sauropus androgynus*

[ID-78]
The selection of Indonesian medicinal plant natural compounds as Akt inhibitor candidates by using molecular docking study approach

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Abstract

Colorectal cancer is the third most cancer incidence rate in the world. The major cause of colorectal cancer is the overexpression of EGFR gene. Consequently, anti-EGFR is used for colorectal cancer treatment. Unfortunately, the majority patients are resistant to anti-EGFR. One possible cause of anti-EGFR resistance is the PTEN loss of function. PTEN loss of function leads the AKT hyperactivation resulting constitutive activation of the PI3K-AKT signaling pathway. Inhibition of this signaling pathway by using AKT inhibitor can benefit the anti-EGFR resistant patient. Several AKT inhibitor candidates have been developed, however they had not shown significant inhibition effect in clinical trials. Hence the effort to find new compounds with optimal inhibition effect towards AKT is needed. The new potential compounds can be derived from plants. Indonesia has high biodiversity therefore it provides many medicinal plants contain natural compounds with anticancer activity. This study was conducted to find natural compounds from Indonesian medicinal plants to be potentially developed as AKT inhibitor. The data of plant species and natural compounds were collected by literature study. The natural compounds were filtered in-silico utilizing oral drug parameters which were molecular weight, solubility, GI absorption and Lipinski`s rule of five. The refinement procedure was applied to improve AKT1 protein structure quality. The molecular docking simulation was done using Autodock Vina. The determination of potential compounds were done by analyzing the docking score and the hydrogen and hydrophobic interactions of ligand with the important residues within binding site. This study collected 1311 natural compounds from 320 Indonesian medicinal plant species. 327 of 1311 filtered natural compounds were met the oral drug parameters and used for docking. This study results found the binding affinity of morindone (-9.1 kcal/mol) and porphyrin (-9 kcal/mol) were better than controls (-7.9 kcal/mol up to -8.1 kcal/mol). In addition, morindone and porphyrin interacted with more important residues than controls. In conclusion, morindone and porphyrin were potential to be developed as AKT inhibitor.

Keywords: AKT, molecular docking, natural compound, Indonesian plant

[ID-79]
Mitragynine: A review of its extraction, identification, and purification methods

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Abstract

Mitragynine is one of the dominant alkaloids present in *Mitragyna speciosa*. The compound possesses several pharmacological properties such as antinociceptive, anti-inflammatory, and anti-cancer. Studies have reported various methods in extracting mitragynine, both conventional and renewable technology combined with acid-base techniques for the enrichment and purification of mitragynine from M. speciosa. Several chromatography and spectroscopy instruments such as HPLC, LC-MS, GC-MS, and NMR have been used to identify mitragynine and its content in both the extract and fraction mixtures. In this review, we aim to provide insight on how the methods of extraction, purification, and identification of mitragynine have been developed over the last few decades. This report shows comparison among the various approaches in extracting mitragynine and points out the facts that different methods gave different yields of the compound.

Keywords: Mitragynine, Alkaloids, *Mitragyna speciosa*, Kratom, Flash chromatography

[ID-80]
Isolation of compounds with tyrosinase inhibitory activity from the methanol extract of *Meniran* Herbs (*Phyllanthus niruri* Linn.)

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Abstract

Meniran (*Phyllanthus niruri* L.) is a wild plant in the *Euphorbiaceae* family which grows in tropical climates. The plant is known to possess antioxidant activity and is rich in phenolic compounds. Since plants with high phenolic content and high antioxidant activity are known to exhibit high inhibition of tyrosinase activity, the purpose of this study is to determine the inhibitory activity of the tyrosinase enzyme by methanol extract of *meniran* (*P. niruri* L.) and to isolate secondary metabolites from the extract and fraction of *meniran* (*P. niruri* L.) which exhibits inhibitory activity against tyrosinase. The in vitro tyrosinase inhibitory activity assay was conducted with the 96-well microplate method with kojic acid as the positive control, while the separation and purification of compounds were carried out using chromatography techniques. The methanol extract and n-hexane fraction showed tyrosinase inhibitory activity with IC_{50} of 11.05±0.16 and 2.57±0.08 mg/ml, respectively. Three bioactive compounds have been isolated from the n-hexane fraction. Based on the UV spectrum and the HPLC overlay with standard, compound 1 was identified as phyllanthin, while compound 3 was elucidated as hypophyllanthin based on the UV, ^{1}H-NMR, and ^{13}C-NMR spectra. Meanwhile, compound 2 could not be fully identified and could only be predicted to be a compound from the lignan group based on the UV spectrum. Furthermore, phyllanthin (3) was shown to demonstrate inhibitory activity against tyrosinase with IC_{50} of 264.57±3.74 µg/ml. In summary, both *meniran* extract and phyllanthin (3) were found to exhibit inhibitory acitivity against the tyrosinase enzyme.

Keywords: *Phyllanthus niruri*, meniran herb, tyrosinase, phyllanthin, hypophyllanthin

[ID-81]
Method development of quercitrin enrichment from Asthma-Plant (*Euphorbia hirta* L.) using aromatic macroporous resin

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Abstract

Asthma-plant contains high amount of quercitrin which make it a potential new source for flavonoids. This study aims to develop a method of quercitrin enrichment by utilizing macroporous resin, which is known to be safer, more eco-friendly, economics, and efficient. Evaluations were conducted over the performance and separation characteristics of the macroporous resin in quercitrin enrichment as well as the adsorption and desorption of quercitrin by the macroporous resin. The results showed that the adsorption process of the macroporous resin in relation to the amount of quercitrin in the extract were in accordance with the second order model, which means that the process of adsorption is affected by other compounds. Furthermore, the examination of the isotherm adsorption fit the Freundlich's model (R^2= 0.9850) rather than the Langmuir's one (R^2= 0.4334). In the optimal condition, the enrichment of quercitrin by using macroporous resin increased the abundance of quercitrin by nearly five times, from 3.60% of quercitrin content in the extract to 17.02% in the quercitrin-rich fraction, with recovery yield of 50.39%.

Keywords: Asthma-plant (*Euphorbia hirta* L.), flavonoid, quercitrin, macroporous resin, adsorption, desorption

[ID-82]
Implementation of dimer-based screening system in *Escherichia coli* BL21(DE3) for selection of HIV protease inhibitor

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Abstract

The treatments available for HIV patients are now able to extend the life-span to near normal life expectancy. One of which is the antiretroviral therapy regimen for HIV patient that has proven to prolonged infection development and even possible to prevent transmission. Even so, scientists have found mutations that may lead to drug resistance. Therefore, a high-throughput screening system is needed to accelerate the screening of potential antiretroviral drugs. The dimer-based screening system (DBSS) utilizes DNA-binding domain of AraC regulator gene by fusing Indonesian HIV isolate (HIVid) with the AraC protein. The dimerization of HIV protease activates AraC protein to repress the expression of reporter gene, emGFP which is regulated under the AraC promoter. This study validated the construct and expression of HIVid protease and implemented the DBSS system. Through polymerase chain reaction (PCR) and DNA sequencing, the construct was validated along with protein expression by using sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS PAGE). The total of 8 compounds were tested using the DBSS. Later, 2 potential candidates for HIV protease inhibitors were then analyzed further by molecular docking to confirm their future potential as HIV protease inhibitors. The compounds were identified as kalofolat D acid and isokalolongoat acid methyl ester. Thus, our finding suggests that this DBSS system might me useful in screening of the HIV protease inhibitor candidates.

Keywords: DBSS, HIV, AraC, dimerization

[ID-83]
Metagenomics analysis of microbial co-infection in SARS-CoV-2 patients from West Java, Indonesia

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Abstract

Since its first identification in the late 2019, SARS-CoV-2 has been causing the global coronavirus disease 2019 (COVID-19) pandemic. This emerging disease is presented in multiple characteristics of clinical manifestation. Asymptomatic/pre-symptomatic cases take up the majority of the incidents, while the other cases occupy a categorical degree of severity with critical illness usually end up in fatality. These clinical outcomes are determined by numerous factors including host response and genetic, viral characteristics, and also host microbial environment. Therefore, our study aims to identify possible co-infection and viral strains affecting the disease severity in mildly symptomatic and asymptomatic COVID-19 patients. In this study the COVID-19 patients were recruited from West Java Health Laboratory, Indonesia. We collected nasopharyngeal samples from asymptomatic (n=2) and mildly symptomatic (n=2) patients. Sequencing libraries were prepared with Illumina Stranded Total RNA Prep with Ribo-Zero™ Plus to synthesize cDNA and deplete rRNAs. SARS-CoV-2 genome assembly was performed on Illumina BaseSpace Dragen RNA Pathogen Detection web-based program. Metagenomic analysis was performed on Illumina BaseSpace Dragen Metagenomics Pipeline. Our analysis showed circulating Pango Lineage strain of B.1.1 and B.1.1.398 infected both asymptomatic and mildly symptomatic patients. Compared with asymptomatic patients, patients with mildly symptoms showed a depletion of the normal microbiome, Cutinebacterium acnes, and co-infection with pathogenic Streptococcus pneumoniae. Thus our finding suggests that the presence of certain microbial during infection period might affect the clinical outcome of COVID-19 patients. Therefore, the respiratory tract microbial detection might be useful as an input in COVID-19 clinical management.

Keywords: Coinfection, Disease severity, SARS-CoV-2

[ID-84]
Development of screening system for compounds that potentially inhibit dimerization of cytoplasmic domain of PhoR in *Mycobacterium tuberculosis*

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Abstract

Resistance is the main problem in antibiotic usage as therapy for tuberculosis. Therapy approach that can lower resistance is needed. Two-component system PhoR-PhoP which controls virulence of Mycobacterium tuberculosis can be targeted for novel tuberculosis drug. Compounds that inhibit the system can weaken the virulence of the bacterium, thus making the pathogen easier to be eliminated by immune system. Dimerization of cytoplasmic PhoR (cytoPhoR) is an important step in PhoR-PhoP regulation. Screening of compounds that can inhibit dimerization of cytoPhoR is done by fusing DNA sequence coding cytoPhoR and DNA sequence coding DNA-binding domain of AraC repressor, which from the previous experiment showed to be able to best repress the expression of emerald green fluorescence protein (EmGFP) as reporter gene under the control of araC promoter in pRSET vector. In this research, pRSET-araCsitoPhoR plasmid from previous research was optimized by cytoPhoR coding DNA codon optimization for Escherichia coli BL21(DE3) host and addition of terminator downstream DNA sequence coding fusion protein. Optimized plasmid construct, pAraC_PhoRMTB, was then synthesized and confirmed using DNA sequencing. Confirmed plasmid was then transformed into Escherichia coli BL21(DE3). Screening of 8 organic compounds, which are chosen based on their antibacterial activity, showed that JH-1 which is isolated from black cumin, can increase EmGFP fluorescence of the transformed culture the most, up to 36.31% which indicate its ability to inhibit dimerization of cytoPhoR. This result shows that JH-1 can inhibit cytoPhoR dimerization and this screening system shows potential to be used for other dimerization protein system.

Keywords: dimer, PhoR, screening, two-component system

[ID-85]
The effectiveness of chitosan soaking in polyester-cellulose dayak woven as in vitro antimicrobial mask

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Abstract

Effective masks can be made using local woven cloth from Dayak Sintang, Sintang Regency, West Kalimantan. This innovation contains antimicrobial compounds combined with Dayak woven fabric, chitosan. Chitosan is intended to have 4 layers mask which contains high filteration, durable, safe, effective to use, and function as antiviral and antifungal. This research aims to determine the effect of chitosan immersion on the preparation of antimicrobial masks made from Dayak Sintang woven fabric. To obtain masks that have antimicrobial activity through antimicrobial test stage and analyzed to determine the occurrence of chemical bonds using FTIR test, and compared with the surface structure with SEM. Fixation of chitosan on woven fabrics can inhibit microbes growth, while the non-woven fabrics did not show any inhibition. The FTIR test results show the functional groups of woven fabrics before and after fixation have differences where at a wavelength of 3500-3000 cm^{-1}. SEM analysis structure of the woven fabric before and after fixation did not show a significant difference, and there was no fiber damage due to the chitosan fixation process. This research is able to produce innovative mask formulations containing antimicrobial compounds made from Dayak woven fabrics that are effective to use and remain stylish.

Keywords: Chitosan, Dayak, Exhaust, Fiber, Fixation

[ID-86]
Abundance of halotolerant nitrogen fixing rhizobacteria, c-organic of soil, chlorophyll content and growth of rice plants due to different composition and dosage of organic ameliorant on saline ecosystems

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Abstract

High salinity of soil impairs the abundance of beneficial microbial communities namely halotolerant nitrogen fixing rhizobacteria and soil fertility thus disrupting the growth of rice plants in saline soils. Utilization of organic ameliorants is expected to be able to increase the beneficial microbial population and restore soil fertility resulting in better rice plant growth. This research aimed to obtain composition and dosage of organic ameliorant to maintain an abundance of halotolerant nitrogen fixing rhizobacteria, increase C-organic of soil and growth of rice plants in saline ecosystems. The experiment was carried out from September to November 2020 in Greenhouse at Jayamukti Village, Cilamaya Wetan District, Karawang Regency using a factorial randomized block design with two factors. First factor was composition of organic ameliorants consisted of five levels, second factor was dosage of organic ameliorants consisted of four levels then repeated three times. Experiment used with indigenous moderately saline soil with EC of 7.57 dS m^{-1}. Results showed that population of halotolerant nitrogen fixing rhizobacteria ($12.01x10^9$ CFU mL^{-1}), C-organic of soil (2.02%) and chlorophyll content of rice plant (46.64 SPAD unit) were increased by ameliorating saline soil with 65% straw compost + 10% husk charcoal + 10% coconut shell biochar + 10% dolomite + 5% humic acid. The interaction between 65% straw compost + 10% husk charcoal + 10% coconut shell biochar + 10% dolomite + 5% humic acid at 3 ton ha^{-1} dosage was able to increase rice plant growth by plant height value of 40.10 cm.

Keywords: Ameliorant, Halotolerant, Nitrogen, Rhizobacteria, Saline

[ID-87]
Application of raised bed multilayered media on production of red bean (*Phaseolus vulgaris* L.) and corn (*Zea mays* L.) in monocropping and intercropping systems

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Abstract

Raised bed agricultural cultivation system is suitable for small areas because it is environmentally friendly and does not cultivate the soil. This research uses layered planting media with multilayered no-dig method. This study aims to determine the combination of layered planting media composition and cropping system that gives the best results in maize and red bean production. The design used was a factorial randomized block design (RAK) with 9 replications and 2 treatment factors, namely the composition of the planting media which consist of TP (cardboard, soil, manure), STPK (cardboard, litter, soil, manure, compost) and STPKM (cardboard, litter, soil, manure, compost, mulch) and intercropping and monocropping systems. The results obtained on maize commodities, namely the best effect was shown in the STPKM intercropping treatment with RGR (Relative Growth Rate) values and number of fruits 17.29% and 22.73% respectively. Meanwhile, for red bean commodities, the STPKM intercropping treatment gave the best results on the RGR value with 17.29% and TP monocropping treatment gave the best results on the number of fruits with 19.79%. RYT (Relative Yield Total) value showed the best effect by TP treatment of 43.30%.

Keywords: intercropping, maize, media, monocropping, red bean

[ID-88]
In silico drug repurposing study: computational screening for drug compounds candidate that are potentially used as SARS-CoV-2 Main protease (Mpro) dimerization inhibitor

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Abstract

COVID-19 pandemic, which is caused by SARS-CoV-2, has impacted human life. However, antiviral treatments to alleviate the COVID-19 symptomps are currently in the development stage. SARS-CoV-2 Mpro plays a crucial role on cleaving polyprotein 1a and 1ab of SARS-CoV-2 and can only be active in homodimer state; hence this protein can be a target for anti-SARS-CoV-2. This study aims to find commercial drug compounds that are potentially used as dimerization inhibitor of SARS-CoV-2 Mpro through molecular docking study. Mutations that could change the protein structure were evaluated by aligning 1,058 coding sequences of SARS-CoV-2 Mpro from GISAID with the reference coding sequence from NCBI (NC_045512.2). Interaction profiles of 25 drug compounds to the dimerization interface of SARS-CoV-2 Mpro (PDB ID: 6LU7) was evaluated by molecular docking. Prior to molecular docking, the 6LU7 structure was validated by evaluating the ΔG, Ramachandran Plot, ProSA-Web and MolProbity. It can be found that there are no mutations that significantly change the 3D conformnation of protein. Molecular docking study showed that Saquinavir has the best interaction profiles with % total interaction of 19.27% and interaction affinity of -7.8 kcal/mol. It was concluded that Saquinavir has the best potential to prevent the homodimerization of SARS-CoV-2 Mpro.

Keywords: Antivirus, Drug repurposing, Homodimerization, Inhibitor of dimerization, SARS-CoV-2 Mpro

[ID-89]
In silico screening of indonesian natural active compounds as dimerization inhibitor of C-Terminal domain of SARS-CoV-2 nucleocapsid protein by molecular docking study

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Abstract

Although vaccines have been developed, there are not many antivirals to cure COVID-19 infection. On the other hand, it has been known that nucleocapsid (N) protein able to bind viral RNA, which shows its potential as antiviral target. N-protein dimerization, mediated by C-terminal domain (CTD), is an initial process in helical structure assembly to protect viral RNA. Thus, antiviral that inhibits CTD dimerization, should be able to interfere with structural assembly, which hopefully able to disrupt viral replication. Natural active compounds have potential to be developed as SARS-CoV-2 antiviral. Therefore, this study aims to find antiviral candidates that inhibit SARS-CoV-2 N-protein dimerization by molecular docking approach. The study began with 1081 CTD N-protein sequences alignment to find protein-altering mutations. Then, followed by molecular docking using CTD N-protein model (ID PDB:6ZCO) to screen 166 previously selected natural active compounds. Protein structure was validated prior to molecular docking. The results shows that sequences alignment did not find any protein-altering mutations. Meanwhile, molecular docking found that ocoteine (-8.8 kcal/mol) has the highest %total interaction (20%), followed by sesamin (-8.4 kcal/mol; 17.41%) and porphyrin (-8.6 kcal/mol; 14.28%). It can be concluded that ocoteine has the best potential to be used as SARS-CoV-2 antiviral candidates.

Keywords: Antiviral, Dimerization, Drug screening, Nucleocapsid, SARS-CoV-2

[ID-90]
Phytoremediation of chromium using napier grass (*Pennisetum purpureum*) in horizontal subsurface flow constructed wetland

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Abstract

Chromium (Cr) has been used in the leather tannery industry and its wastewater treatment is usually carried out using a conventional (chemical) system. However, due to expensive costs, many industries are reluctant to proceed with wastewater treatment. One of the low-cost alternative ways for wastewater treatment is using plants through a phytoremediation process. This study is aimed to determine the phytoremediation capacity of Napier grass (*Pennisetum purpureum*) to chromium at concentrations of Cr (VI) 20 ppm, 40 ppm, and leather tannery wastewater. *P. purpureum* was grown in a Horizontal Subsurface Flow Constructed Wetland Pond with the size of 75×40×40 cm3 using a batch system for 31 days. The results showed that *P. purpureum* can tolerate all treatments as the plant survived and grown well. The phytoremediation of Cr by *P. purpureum* was effective at 20 ppm of Cr (VI) as indicated by chemical and physical characteristics of the medium (BOD, COD, pH, and TDS). The removal capacity of the plant to total Cr was varied from 71.79% to 99.96%, and to Cr (VI) from 99.95% to 99.96%. The plant's ability to accumulate Cr in its roots was shown by its translocation factor (TF) < 1, which indicated its capacity as a phytoremediator for Cr.

Keywords: Chromium, horizontal subsurface constructed wetland, *Pennisetum purpureum*, phytoremediation effectivity, tannery wastewater, toleration capacity

[ID-91]
A comparison on growth of *Spirulina platensis* and *Nannochloropsis* sp. in mixed culture and monoculture using aquaculture wastewater as growth medium

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Abstract

Microalgae culture on a large scale with the aim of commercialization has been carried out about 30 years ago and continues to grow until now. Microalgae culture produce biomass and various primary and secondary metabolites that can be utilized in various fields. One example is protein as a dietary supplement and lipids as a raw material for biofuels. This study examines the feasibility of aquaculture wastewater as a growth medium and determines the effect of mixed culture *Spirulina platensis* and *Nannochloropsis* sp. on microalgae's performance and growth pattern. The results showed that in aquaculture wastewater medium, mixed culture cultivation resulted in a higher specific growth rate of 0.328 day^{-1} compared to the specific growth rate of the monoculture cultivation of *Spirulina platensis* (0.305 day^{-1}) and *Nannochloropsis* sp. (0.224 day^{-1}). In addition, the highest number of cells density in mixed culture treatment was much higher (6.05×106 mL^{-1}) compared to *Spirulina platensis* monoculture (2.4×106 mL^{-1}) and *Nannochloropsis* sp. monoculture (1.65×106 mL^{-1}). The mixed culture cultivation affects the growth pattern of microalgae, namely accelerating the lag phase to one day. Therefore, the microalgae cultivation process using either aquaculture wastewater or mixed culture cultivation can be used as an alternative for commercial microalgae production.

Keywords: aquaculture wastewater, mixed culture, Nannochloropsis sp., specific growth rate, *Spirulina platensis*

[ID-92]
Multi-epitope vaccine design against SARS-Cov-2 for Indonesia population using *Reverse Vaccinology* approach

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Abstract

Massive vaccine distribution is considered a crucial step to prevent the spread of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) as the causative agent of COVID-19. This study was conducted to design the multi-epitope self-amplifying mRNA (SAM) vaccine, which consists of selected B-cell and T-cell epitope from surface glycoprotein (S protein) and nucleocapsid phosphoprotein (N protein) of SARS-CoV-2 sample obtained from Southeast Asia. Commonly distributed HLA class I and II alleles of the Indonesia population were used to determine peptide sequences that can trigger this population's high specificity T-cell response. The best vaccine was chosen based on the analysis of tertiary structure validation and molecular docking of each vaccine candidate with TLR-4, TLR-8, HLA-A*24:02 dan HLA-DRB1*04:05. The selected multi-epitope vaccine was added by the gene encoding the replication machinery that allows the RNA amplification in the host cell. This study obtained seven B-cell epitopes and four T-cell epitopes from the protein target, considered highly antigenic, highly conserved, non-allergen, non-toxic, and hydrophilic. Tertiary structure validation determined that one best multi-epitope construction with 269 aa in length contains hBD-2 adjuvant and PADRE carrier peptide, dominates by coil structure, and most residues are predicted to be accessible by solvent and shows high population coverage (99,26%). In addition, molecular docking analysis demonstrated a stable and strong binding affinity with all mentioned immune receptors.

Keywords: self-amplifying mRNA vaccine, SARS-CoV-2, COVID-19, Indonesia vaccine, *reverse vaccinology*

[ID-93]
Multi-epitope vaccine design against dengue virus for Indonesian population with reverse vaccinology approach

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Abstract

Dengue virus (DENV) is a virus that causes dengue fever in Indonesia. The commercial DENV vaccine currently available is considered ineffective because it cannot induce a T cell response. This study aims to develop a multi-epitope HTL, CTL, and BCL DENV 1-4 vaccine for the Indonesian population using a reverse vaccinology approach. The research method was carried out by collecting data from 62,249 DENV protein sequences from NCBI, combining each protein for all serotypes, selecting protein data, analysing diversity, predicting epitope with Human Leukocyte Antigen (HLA) Indonesian people, predicting population coverage. The epitopes were selected into one vaccine construct and then analysed for the characteristics of the vaccine construct and the prediction of the tertiary structure of the chosen vaccine construct, its validation, docking, and in *silico* cloning analysis. Based on the study results, there were 5 CTL epitopes from NS5 protein and 9 HTL epitopes (with three overlapping BCL epitopes) from NS5 and NS1 proteins with a coverage of 96.27% for the Indonesian population.

Keywords: B-cell Linear, Cytotoxic T Lymphocyte, Helper T Lymphocyte, Serotype, HLA

[ID-94]
Liquid-liquid equilibrium for eugenol + asetic acid + water systems at 303.15 K and atmospheric pressure

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Abstract

The objective of this work was to determine ternary liquid-liquid equilibrium for eugenol + acetic acid + water systems at 303.15 K and atmospheric pressure. The experimental apparatus was 25 mL equilibrium cell equipped jacketed water connected to water bath to maintain equilibrium temperature at constant value. The procedure of this experiment was conducted by inserting mixture of eugenol + acetic acid + water at certain composition into equilibrium cell. The solution was stirred for 4 hours and then was allowed for 20 hours in order to separate aqueous and organic phases completely. The equilibrium compositions of each phase were analyzed using gas chromatography. The experimental data obtained in this work were correlated with NRTL and UNIQUAC models giving root standard mean deviation of 1.1% and 1.3%, respectively for eugenol + acetic acid + water system. So it can be said that acetic acid can be used as an alternative for the eugenol separation process.

Keywords: eugenol, liquid-liquid equilibrium, acetic acid, ternary system, equilibrium

[ID-95]
Assessment phytochemical profile as indicator of oil palm plants with stem rots caused by *Ganoderma boninense* in Peatlands

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Abstract

Ganoderma boninense is a species of fungus that causes stem rot disease which generally attacks oil palm plants. The obstacle control disease is difficult to know early symptoms of *Ganoderma boninense* attack. This study aims to detect metabolite profiling produced by oil palm plants as an indicator of the presence or absence of *Ganoderma boninense* to early control stem rot disease. The research was conducted by testing crude extract to determine the content of phenolic compounds, flavonoids, tannins, proteins, and antioxidant activity of the three types of samples (leaves, roots, soil) on each plant criteria. The analysis method using Spectrophotometry UV-Vis with a predetermined wavelength. The results showed the methanol extract of metabolite compounds produced was higher in oil palm plants that were attacked by *Ganoderma boninense*, which is equal to 18.65 - 43.56 ml GAE/g phenol, 2.29-4.5 ml QE/g flavonoid, and 21.77-25.52 ml TAE/g tannin and the antioxidant activity was 47.65%.

Keywords: Bioindicator, Metabolite, Systemic, Induce, Phenol

[ID-96]
Dengue diagnostic kit "DENVIT Real-Time PCR" for early detection of dengue in Indonesia

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Abstract

Dengue is a disease caused by dengue virus (DENV) transmitted by *Aedes aegypti* and *Aedes albopictus*. Dengue is endemic in Indonesia where dengue commonly occurs with increasing incidence rate annually. Early detection of dengue accurately and rapidly is key to dengue outbreak control. However, diagnostic test for dengue developed based on DENV sequences endemic to Indonesia hasn't been available. Therefore, there is an urge to develop a SYBR Green Real-Time PCR-based dengue diagnostic test to solve that problem. The diagnostic test design has been developed and characterized. The positive control used is pUC57 plasmid containing the genome fragment from 3' UTR region of dengue virus that circulate in Indonesia. The oligonucleotides are DENV1_F and DENV1_R. The determination of rRT-PCR standard curve linearity, limit of quantification (LOQ), and limit of detection (LOD) was done using 2 different commercial rRT-PCR kit: SensiFast® SYBR® Lo-Rox (Bioline) and QuantiTect® SYBR® Green RT-PCR (Qiagen). The designed diagnostic test validation was done using clinical specimen of dengue suspect patients that were tested using dengue IgG/IgM and NS1 antigen-based rapid diagnostic test. The diagnostic test design has good standard curve linearity for both rRT-PCR kit, slope = -3,1996 and R2 = 0,997 for QuantiTect® also slope = -3,4472 and R2 = 0,9959 for SensiFast™. The LOQ and LOD value of the diagnostic test was successfully determined with LOQ = 10.107 copy/mL and LOD = 10.107 copy/mL for both kits. The diagnostic test design was able to detect DENV RNA from dengue positive clinical specimens with very high concordance with NS1 antigen detection. Based on these results, it can be concluded that the developed dengue diagnostic test has been characterized and can be used as dengue diagnostic test candidate in Indonesia.

Keywords: dengue, DENV, rRT-PCR, SYBR Green, standard curve

[ID-97]
Valorization of empty palm bunch waste (*Elaeis guineensis*) into lyocell fibre using environmentally friendly solvent N-Methylmorpholine N-Oxide (NMMO)

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Abstract

Fast fashion is a clothing trend where clothes are produced in a short period of time. Fast fashion is one of the industries that has problems in terms of waste management. This industry accounts for 7% of total global waste production in terms of textile waste. On the other hand, there is another industry that is experiencing similar problems. The palm oil industry generates 9 times more waste than its main product, where most of the waste is empty palm oil bunches (EOPFB). EOPFB contains cellulose ranging from 41.3 to 46.5%, where cellulose is the main component used in the production of clothing fiber. In this study, cellulose was extracted from EOPFB using the soda pulping and bleaching method. The obtained cellulose was processed into lyocell fibre through dry-jet wet spinning method using 85% n-methylmorpholine n-oxide (NMMO) solvent, where at this stage, the volume of NMMO given was varied into 3 treatments, namely 50 mL (N5), 80 mL (N8), and 160 mL (N16) for 24 grams cellulose. In the process, 289.9 grams of EOPFB yielded 74.36 grams of cellulose and 40 grams of lyocell fiber. The N8 has a lower water absorption and thickness swelling than N5. During the 4-hour process, absorption of N5 and N8 was 100% and 75.24%, respectively, while thickness swelling of N5 and N8 were 41.42% and 32.34%. The value of N8 in the linear diameter and density test is less than N5, which is 0.009 g/cm and 8.904 mm, while variations of N5 are 0.014 g/cm and 10.819 mm. From this study, it can be concluded that the optimum composition for the manufacture of lyocell fiber is 80mL of 85% NMMO solvent and 24 grams of cellulose. When produced on a pilot scale, the waste EOPFB-to-lyocell fiber production process obtains a GPM of 40%. This proves that EOPFB has a significant potential to be used as a clothing material in terms of characteristics, environmental impact, and profit.

Keywords: EOPFB, Cellulose, Lyocell, Fiber, Waste

[ID-98]
Analysis of inhibition potential of flavonoid and xanthone compounds from various Indonesian plants against Bcl-2 and Bcl-xL with molecular docking

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Abstract

The intrinsic apoptotic pathway is often targeted in cancer treatment. Proteins that can be targeted from this pathway is the Bcl-2 and Bcl-xL proteins. One of the strategies used to find drugs is to look for compounds found in plants. Therefore, this study aims to determine bioactive compounds that have the potential to become inhibitors of Bcl-2 and Bcl-xL proteins and their effects through in silico interaction analysis. Molecular docking simulations were performed using AutoDock Vina software, and interaction and bond visualization using LigPlot+. The results showed that artonin E, calotetrapterin B and morellic acid had the best affinity for Bcl-2 protein with docking score of -8.7 kcal/mol, -8.4 kcal/mol, and -8.5 kcal/mol, respectively. Artonin O, bractatin and morellic acid compounds have the best affinity for Bcl-xL protein with docking score of -8.8 kcal/mol, -9.1 kcal/mol, and -9.6 kcal/mol. Visualization result of the bond between protein and bioactive compounds showed hydrophobic interactions and hydrogen bonds at important residues of protein which indicated the compounds used could be inhibitors for Bcl-2 and Bcl-xL proteins. In addition, these compounds bind to proteins in the hydrophobic groove of both proteins. Based on these results, it can be concluded that artonin E, calotetrapterin B and morellic acid have the potential to be inhibitors of Bcl-2 protein by forming hydrogen bonds and interacting hydrophobically with key residues, as well as binding to the hydrophobic groove region of Bcl-2. Artonin O, bractatin and morellic acid compounds have the potential to be inhibitors of Bcl-xL by forming hydrogen bonds and interacting hydrophobically with key residues, as well as binding to the hydrophobic groove region of Bcl-xL.

Keywords: cancer, Bcl-2, Bcl-xL, molecular docking, flavonoid, xanthone

[ID-99]
Analysis of the potential of flavonoid and xanthone compounds from various indonesian plant extracts as MEK1 and ERK2 inhibitors: A molecular docking approach

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Abstract

Classical MAPK pathway is one of the most deregulated pathways in cancer, which is hyperactive and is responsible for 40% of human cancers. MEK1 is a direct activator of the ERK1/2 protein, which plays an important role in the process activation of many transcription factors involved in the expression of regulatory proteins for cell proliferation and survival. Currently there are alrady commercial anticancer drugs, for-instance trametinib and ulixertinib, which can inhibit MEK1 and ERK2 specifically. However, both drugs is can cause unwanted side effects. Therefore, the search for MEK1 and ERK2 inhibitors that have lower side effects is still being carried out. Bioactive compounds extracted from plants, such as flavonoids and xanthones, have been tested on various cell lines and have good potential anticancer activity with low toxicity. In this study, flavonoid and xanthone compounds, namely alpha mangostin, artonin e, artonin o, bractatin, calotetrapterins b, cochinchinone c, cryptocaryone, garcinone d, infectocaryone, and morellic acid, were tested in silico through the molecular docking method with the aim to find out the potential and to predict mechanism of inhibition against MEK1 and ERK2 through the formed interactions. Molecular docking simulations were performed using Autodock Vina 1.1.2. The docking simulation results were visualized using Pymol and the inhibition mechanism was analyzed using Ligplot+ v.2.2. The results showed that artonin o and alpha mangostin had the potential to be MEK1 and ERK2 inhibitors, with binding affinity values of 10.7; 8.8 kcal/mol and -9.6; -9.5 kcal/mol. Cryptocaryone are also known to have potential as MEK1 inhibitors with a binding affinity value of -9.2 kcal/mol, while calotetrapteins b compounds have potential as ERK2 inhibitors with a binding affinity value of -9.9 kcal/mol. Hydrogen bond and hydrophobic interactions with important residues, including Lys97, Met143, HRD motif, DFG motif, Ser212, and the activation segments Leu215, Ile216, Met219, stabilize the interaction between artonin o, alpha mangostin, and cryptocaryone in MEK1. Furthermore, the stabilization of interaction between artonin o, alpha mangostin and calotetrapterins b on ERK2 occurs due to hydrogen and hydrophobic interactions at the Lys54 and Asp167 residues. In summary, artonin o and alpha mangostin may inhibit MEK1 and ERK2 simultaneously, cryptocaryone and calotetrapterins have potential to inhibit MEK1 and ERK2 respectively. The results of this study can provide an initial reference for the development of MEK1 and ERK2 inhibitors based on natural compounds of the flavonoid and xanthone groups.

Keywords: cancer, inhibitor, MEK1, ERK2, flavonoid, xanthone, molecular docking, binding affinity

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