



ICOTENS

INTERNATIONAL CONFERENCE ON TECHNOLOGY AND SCIENCES

2nd International Conference on Technology and Science

*Sustainable Natural Sciences in the Era of
Artificial Intelligence and Green Technology*

PROGRAM BOOK



 **31**
OCTOBER
2026

 **IICC Botani Square**
Bogor - Indonesia



Sustainability



Education



Technology



Culture



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Welcome Message from Dean of Faculty of Mathematics and Natural Sciences Pakuan University



Welcome Message from the Dean of FMIPA Universitas Pakuan

It is my great pleasure to welcome all distinguished speakers, researchers, academics, professionals, and participants to the 2nd International Conference on Technology and Science (ICOTENS 2026), organized by the Faculty of Mathematics and Natural Sciences, Universitas Pakuan, Bogor, Indonesia.

Under the theme "Sustainable Natural Sciences in the Era of Artificial Intelligence," this conference reflects the growing importance of bringing scientific knowledge and emerging technologies together to address complex challenges. Artificial intelligence is transforming how we investigate natural phenomena, analyze scientific data, and develop innovative solutions. At the same time, these advances call for a continued commitment to scientific integrity, environmental responsibility, and the meaningful application of research for the benefit of society.

ICOTENS 2026 provides an international forum for exchanging ideas, sharing research findings, and exploring new opportunities for collaboration across disciplines. By bringing together perspectives from artificial intelligence, mathematics, environmental sciences, chemistry, pharmaceutical sciences, and digital technology, we hope to encourage interdisciplinary approaches that strengthen both scientific advancement and sustainable development.

On behalf of the Faculty of Mathematics and Natural Sciences, Universitas Pakuan, I extend my sincere appreciation to our distinguished keynote and invited speakers, international academic partners, scientific committee, organizing committee, reviewers, sponsors, and all contributors whose dedication has made this conference possible. Your participation and support are essential to the success of this scientific gathering.

I hope that ICOTENS 2026 will foster insightful discussions, inspire productive research partnerships, and create opportunities for future academic cooperation. May the knowledge and connections developed through this conference continue to contribute to scientific progress and deliver lasting benefits to our communities and the environment.

I wish everyone a rewarding conference and a memorable experience in Bogor, Indonesia.

Sincerely,

A handwritten signature in black ink, consisting of a stylized 'D' followed by a horizontal line.

Asep Denih, S.Kom. M.Sc., Ph.D.

Dean of Faculty of Mathematics and Natural Sciences
Pakuan University



Welcome Message from ICOTENS 2026 Conference Chair

Dear Distinguished Speakers, Esteemed Guests, Fellow Researchers, and Participants,

On behalf of the Organizing Committee, it is my great pleasure to welcome you to The 2nd International Conference on Technology and Science (ICOTENS 2026), organized by the Faculty of Mathematics and Natural Sciences, Universitas Pakuan, Indonesia.

This year's conference, under the theme "Sustainable Natural Sciences in the Era of Artificial Intelligence and Green Technology," reflects our commitment to advancing scientific knowledge, fostering innovation, and promoting interdisciplinary collaboration in response to the challenges of our rapidly changing world.

Today, science and technology are evolving at an extraordinary pace. Artificial intelligence is transforming the way we conduct research, analyze complex data, and develop innovative solutions, while green technologies are opening new pathways toward a more sustainable future. These developments remind us that scientific progress is not only about discovery and innovation, but also about responsibility, collaboration, and meaningful contributions to society.

ICOTENS 2026 provides an opportunity for researchers, academics, students, and professionals from diverse scientific backgrounds to exchange ideas, share research findings, and establish valuable connections. Through keynote lectures, invited presentations, oral sessions, and poster discussions, we hope to encourage constructive scientific dialogue and inspire future research collaborations.

I would like to express my sincere appreciation to our distinguished keynote and invited speakers for generously sharing their knowledge and expertise. My gratitude also extends to our co-host institutions, sponsors, scientific committee, reviewers, organizing committee members, and all partners whose dedication and support have made this conference possible.

To all presenters and participants, thank you for contributing your research, perspectives, and enthusiasm to ICOTENS 2026. Your participation is at the heart of this conference, and your scientific contributions are what make this gathering meaningful.

It is my sincere hope that this Book of Abstracts will serve not only as a collection of scientific contributions, but also as a source of inspiration, new perspectives, and opportunities for future collaboration.

As we gather in Bogor, Indonesia, and connect with colleagues joining us virtually, let us embrace the spirit of our conference tagline: "Harmony of Science, Technology, and Culture for Sustainability."

Once again, welcome to ICOTENS 2026. We look forward to your valuable contributions, inspiring discussions, and the new collaborations that may emerge from this conference.

Warm regards,

Dr. Uswatun Hasanah, M.Si.
Conference Chair of 2nd Icotens

ACKNOWLEDGMENTS

Co Host by:



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Meet Our Speakers

Opening And Special Speech



Prof. Dr. rer. pol. Ir. H. Didik Notosudjono, M.Sc., IPU., ASEAN Eng., APEC Eng
Rector of Pakuan University



Letjen TNI Dr. Mohamad Hasan S.H., M.H.
Komandan Komando Pembina Doktrin, Pendidikan, dan Latihan TNI AD (Dankodiklatad) Indonesia

Keynote Speakers



Asep Denih, S.Kom, M.Sc, Ph.D.
Universitas Pakuan Indonesia



Profesor (Associate) Ahad Ali, Ph.D.
Lawrence Technological University, Michigan, USA.



Prof. Masahiro Tasumi
Kindai University, Japan



Maria Luisa T. Mason, Ph.D.
Central Luzon State University (CLSU), Philippines



Prof. Dr. apt. Elfahmi, S.Si., M.Si.
Sumatera Institute of Technology Indonesia

Meet Our Speakers

Invited Speaker



Associate Prof. Ts. Dr. Muhammad Abdul Latiff Abu Bakar
Universiti Tun Hussein Onn Malaysia.



(Profesor (Associate). Dr. Aida Azlina Binti Ali)
University of Technology Mara (UiTM), Malaysia.



Assoc. Prof. Ir. Ts. Dr. Muhamad Azizi Mat Yajid
Universiti Teknologi Malaysia



Prof. Divon G. Tamdang
Guimaras State University, Phillipines.



Prof. Husni Teja Sukmana, Ph.D
Dean of FST UIN Syarif Hidayatullah Jakarta
General Secretary of APTIKOM, Indonesia



Prof. Dr. Omer Faruk Rencber
Gaziantep University, Turkey

Conference Program

1. Registration & Opening Ceremony

Time (WIB)	Duration	Program	Venue
07.00 - 08.30	90'	Participant Registration and Poster Submission	Registration Area
08.30 - 08.35	5'	Opening Ceremony Opening Prayer	Main Room
08.35 - 08.45	10'	Singing of the Indonesian National Anthem Singing of the Universitas Pakuan March	Main Room
08.45 - 09.00	15'	Rampak Gendang Performance by Sanggar Annisa Rumpaka	Main Room
09.00 - 09.05	5'	Welcome Remarks Report by the Organizing Committee Chair (Dr. Uswatun Hasanah, M.Si.)	Main Room
09.05 - 09.10	5'	Welcome Remarks by the Dean of FMIPA (Asep Denih, S.Kom., M.Sc., Ph.D.)	Main Room
09.10 - 09.15	5'	Welcome Remarks and Official Opening by the Rector of Universitas Pakuan (Prof. Dr. rer. pol. Ir. H. Didik Notosudjono, M.Sc., IPU., ASEAN Eng.)	Main Room
09.15 - 09.20	5'	Welcome Remarks and Official Opening by the Chair of the Foundation Ceremonial Drum Opening (The Rector of Universitas Pakuan, accompanied by the Chair of the Foundation, the Dean of FMIPA, and the Organizing Committee Chair)	Main Room
09.20 - 09.25	5'	Group Photo with Invited Guests, Participants, and Organizing Committee	Main Room
09.25 - 09.30	5'	Coffee Break	Main Room

2. Keynote Speaker Sessions

Time (WIB)	Duration	Program	Venue
09.30 - 09.35	5'	Keynote Speaker Session	Main Room
09.35 - 09.45	10'	Special Opening Letnan Jenderal TNI Dr. Mohamad Hasan, S.H., M.H.	Main Room
09.45 - 10.10	25'	Keynote Session 1 ; Asep Denih, S.Kom., M.Sc., Ph.D.	Main Room
10.10 - 10.35	25'	Keynote Session 2 ; Prof. Masahiro Tasumi Moderator Keynote 1&2 : Dr. Usep Suhendar, M.Si	Main Room
10.35 -10.45	10'	Discussion & Transition	Main Room
10.45 - 11.10	25'	Keynote Session 3 ; Maria Luisa, Ph.D.	Main Room
11.10 - 11.35	25'	Keynote Session 4 ; Prof. Dr. apt. Elfahmi, S.Si., M.Si Moderator Keynote 3&4 : Prof. Dr. Sata Yoshida Srie Rahayu, M.Si	Main Room
11.35 - 11.45	10'	Discussion & Transition	Main Room
11.45 - 12.10	25'	Keynote Session 5 (Online)Assoc. Prof. Ahad Ali, Ph.D. Moderator Keynote 5: Gustian Rama Putra S.Kom., MMSI	Main Room
12.10 - 12.20	10'	Discussion & Transition	Main Room

3. Lunch & Parallel Sessions

Time (WIB)	Duration	Program	Venue
12.20 - 13.15	55'	Poster Exhibition and GDG Session	Main Hall
12.20 - 13.15	55'	Lunch and Prayer Break [concurrent with poster exhibition]	Venue
13.15 - 15.00	105'	Parallel Sessions I and Invited Speaker Presentations (Rooms 1–6)	Parallel Rooms

4. Invited Speakers – Rooms 1–3

Time (WIB)	Duration	Program	Venue
13.15 - 13.30	15'	Invited Speaker Prof. Ir. Ts. Dr. Muhamad Azizi Moderator: Dr. Muhammad Fathurrahman, M.Si.	Room A1 Main Hall)
13.15 - 13.30	15'	Invited Speaker Assoc. Prof. Aida Azlina binti Ali, Ph.D. Moderator: Dr. apt. Novi Fajar Utami, M.Farm.	Room A2(Main Hall)
13.15 - 13.30	15'	Invited Speaker Prof. Husni Teja Sukmana, S.T., M.Sc., Ph.D.Moderator: Dr. Tjut Awaliyah Zuraiyah, M.Kom.	Room B1(2nd Floor)

5. Invited Speakers – Rooms 4–6

Time (WIB)	Duration	Program	Venue
13.15 - 13.30	15'	Invited Speaker (Online) ; Prof. Divon G. Tamdang Moderator: Sara Nurmala, S.Farm., M.Farm.	Room B2 (2nd Floor)
13.15 - 13.30	15'	Invited Speaker (Online) ; Assoc. Prof. Ts. Dr. Muhammad Abdul Latiff Moderator : Dr. Desi Kartina, M.Si	Room 5(Online Room)
13.15 - 13.30	15'	Invited Speaker (Online) ; Prof. Dr. Omer Faruk Rencber Moderator: Yasmin Erika Faridhan, M.Si.	Room 6(Online Room)

6. Afternoon Program

	Duration	Program	Venue
14.45 - 15.15	30'	Coffee and Prayer Break (tentative; overlaps with parallel sessions)	Venue
15.15 - 16.30	75'	Parallel Sessions (continued)	Venue
16.30 - 18.00	90'	Closing Session and Best Presenter / Best Poster Awards	Main Hall

Presentation Schedule

ORAL PRESENTER ONLINE
GROUP A (BIOLOGY, CHEMISTRY, PHARMACY)

Topic :

1. Green Chemistry and Sustainable Materials
2. Biodiversity and Environmental Sustainability
3. Pharmaceutical Sciences and Health Innovation

Room : A**Location : Main Hall****Duration : 140 minute**

No	Name	Time	Title
1	Hidawati	13.30	Characterization Of A Myristic Acid–Tetrabutylammonium Bromide Mixture As A Potential Deep Eutectic Solvent (Des) For Greener Solvent Design
2	Muhammad Priyadi	13.40	Anticaries Activity Of Wedelia Trilobata Ethanolic Extract Against Streptococcus Mutans
3	Yulianita Pratiwi Indah Lestari	13.50	Isolation Of A-Cellulose And Characterization Of Microcrystalline Cellulose (Mcc) From Kenikir Leaf Residue (Cosmos Caudatus Kunth) As A Pharmaceutical Excipient
4	Dvito Alkindi	14.00	Green Synthesis Of Nio Nanoparticles Using Ananas Comosus Leaf Extract For Lithium-Ion Battery Anodes
5	Tiarmauli Natalia Purba	14.10	The Mesoporous Biochar Composite Derived From Oil Palm Empty Fruit Bunch (Efb) Modified With Natural Zeolite: A Preliminary Study As A Livestock Feed Additive For Ammonia Emission Mitigation
6	Firnanelty	14.20	Green Synthesis Of Nano-Hydroxyapatite From Meretrix Meretrix Shell Waste Using Sonication Method: Structural And Functional Characterization
7	Icha Paulina Simbolon dan Yona Jane Nanda	14.30	Analysis of the Effects of Pre-Analytical Factors on the Stability of Glucose and Total Bilirubin Test Results Based on Tube Type and Testing Delay

No	Name	Time	Title
8	Reni Salim	14.40	Instrumental Leaf Color And Its Relationship With Pigmen And Secondary Metabolite Contents In Graptophyllum Pictum,
9	Dewi Oktavia Gunawan	14.50	Association Between Pharmacist Counseling And Medication Adherence Among Patients With Hypertension: A Cross-Sectional Study Using Electronic Medical Records At Pasir Mulya Health Center, Bogor, Indonesia
10	Enung Siti Nurhidah	15.00	Piper-Derived Compounds In Cervical Cancer: A Critical Review Of Selected Evidence On Chemistry, Bioactivity, And Translational Gaps
11	Yani Lukmayani	15.10	Reviewing Solvent Type On Antioxidant Activity Of Red Algae Extracts
12	Shesanthi Citrariana	15.20	Formulation And Evaluation Of Lip Balm Karamunting Flower Extract (Melastoma Malabathricum L.)
13	Dr. Mamay Maslahat, S.Si., M.Si.	15.30	Evaluation of Etlingera elatior using an untargeted metabolomic fingerprinting, flavanoid content, and antibacterial activity approach based on differences in plant parts and extraction methods
14	Nina Herlina	15.40	Comparative Potency and Interactions of Orthosiphon-Based Herbal Combinations on Antidiabetic, Antioxidant, and Anti-Inflammatory Activities

ORAL PRESENTER OFFLINE
GROUP A (BIOLOGY, CHEMISTRY, PHARMACY)

Topic :

1. Green Chemistry and Sustainable Materials
2. Biodiversity and Environmental Sustainability
3. Pharmaceutical Sciences and Health Innovation

Room : A1**Location : Main Hall****Duration : 190 minute**

No	Name	Time	Title
1	Nor Suriani Sani	13.30	Green Synthesis and Biological Evaluation of Persicaria odorata-Mediated Silver Nanoparticles
2	Riza Apriani	13.40	Sol-Gel Synthesis of Hydroxyapatite From Pensi Clam Shell Waste For Cr(VI) Adsorption
3	Gilang al qarana & Fathiana	13.50	Leakage-Aware Machine Learning And Explainable Ai For Cross-Article Prediction Of Pharmaceutical Adsorption Capacity
4	Marybet Tri Retno Handayani	14.00	Determination Of A-Amylase Enzyme Inhibitory Activity In-Vitro Of Ultrasonic Extraction Results And Fractions Of Rosella Flower (Hibiscus Sabdariffa L.)
5	Farida Nuraeni, S.Si, M.Si	14.10	Fortification Of Anchovy Flour (Stolephorus Sp.) And Moringa Leaf Flour (Moringa Oleifera) In The Production Of High-Protein And Iron-Rich Rice Crackers
6	Andika	14.20	Network Pharmacology, Molecular Docking, and Molecular Dynamics Approaches to Evaluate the Potential Of Cassia Alata In Diabetic Wound
7	Siti Nashihah	14.30	Physicochemical Characterization and Antioxidant Activity of Baram, a Traditional Dayak Ngaju Fermented Beverage

No	Name	Time	Title
8	Aris Purwanto	14.40	Isolation of Alpha-Cellulose, Preparation and Characterization Of Microcrystalline Cellulose from Gelinggang (<i>Cassia alata</i> L.) Stem Fibers as a Tablet Binder
9	Dian Farida Ismyama	14.50	Evaluation Of Medication Planning And Inventory At Pharmacy X In Bogor Using Abc Analysis
10	Ema Hermawati, M.Farm	15.00	Antifungal Activity Of Nutmeg Seed (<i>Myristica Fragrans</i> Hoult.) Extract Gel Formulated With Taro Starch (<i>Colocasia Esculenta</i> (L.) Schott) Against <i>Trichophyton Mentagrophytes</i> : A Potential Topical Approach For Feline Dermatophytosis
11	Daffa Revanza Fawwaz	15.10	Pengaruh Fotoanoda Tio2-Celes Dan Tio2 Komersial Terhadap Karakteristik Fisikokimia Serta Performa Dye-Sensitized Solar Cell (Dssc) Dengan Sensitizer Antosianin Bunga Telang Dan Rosela
12	Opie Puspitasari	15.20	Subchronic Toxicity Test of a 96% Ethanol Extract of Rumput Kebar (<i>Biophytum Umbraculum</i> Welw.) In Mice (<i>Mus Musculus</i>)
13	Kartini Afriani	15.30	Comparative Phytochemical Profiling And Biological Activities Of Three Mimosa Species: An Untargeted Metabolomics Approach
14	Mutiara Azzahra Bena Reall	15.40	Development Of Red Betel Leaf Authentication Method Using A Combination Of Ftir-Atr And Uv-Vis Spectrum Data Fusion With Chemometrics
15	Arnelia Almuti'ah	15.50	Determination Of Total Phenolic And Tannin Content In Calabash Fruit Juice (<i>Crescentia Cujete</i> L.) And Its Activity As A Bio-Starter For Household Organic Waste Fermentation
16	Dinni Khoerunnisa	16.00	Histopathological Evaluation Of Kebar Grass (<i>Biophytum Umbraculum</i> Welw.) Extract Administration In Rats: Results A 90-Day Subchronic Toxicity Study

No	Name	Time	Title
17	Andra Mahendra	16.10	Potential Hematotoxicity In A Subchronic (90-Day) Toxicity Study Of Kebar Grass Extract (Biophytum Umbraculum Welw.) In Female Sprague-Dawley Rats
18	Muhammad Rayhan Sutoyo	16.20	Optimization Of Methylene Blue Photodegradation Using Zno Nanoparticles Based On Papaya Leaf Extract (Carica Papaya L.) Via Rsm Box–Behnken Design
19	Rima Eka Saputri	16.30	The Effect Of Ultrasonic Extraction Using Different Solvents On Anthocyanin Content And Antioxidant Activity Of Butterfly Pea Flower (Clitoria Ternatea L.) Extract

**ORAL PRESENTER OFFLINE
GROUP A (BIOLOGY, CHEMISTRY, PHARMACY)**

Topic :

- 1. Green Chemistry and Sustainable Materials**
- 2. Biodiversity and Environmental Sustainability**
- 3. Pharmaceutical Sciences and Health Innovation**

Room : A2

Location : Main Hall

Duration : 170 minute

No	Name	Time	Title
1	Tri Devi Sukanti	13.30	The Effect Of Solvent Ratio On The Antioxidant Activity And In Vitro Lipase Inhibition Of Matcha Extract (Camellia Sinensis L.)
2	Jonathan Atmaja	13.40	Terpenoids From The Leaves Of Khaya Anthotheca And Their Anticancer Activity Against Mcf-7 Breast Cancer Cells: In Vitro And In Silico Study
3	Siti Mahyuni	13.50	A Framework For Mapping Metabolite Biodiversity In Indonesian Medicinal Plants Used In Ethnomedicine As A Basis For Pharmacogenomics: An Ai-Assisted Secondary Data Integration Approach
4	Bintang Maulana Ramadhan	14.00	Optical And Electrochemical Evaluation Of Solvothermally Synthesized Ni-Aspartate Bio-Mof For Hydrogen Gas Production Potential
5	Seniar Ferni Prastian	14.10	The Effect Of Extraction Methods On Phenolic Content, Antioxidant Activity And Alfa-Amilase Inhibitory Activity Of Clove Leaves (Syzigium Aromaticum L.) Extract
6	Ahmad Dani	14.20	Evaluation Of The Anti-Inflammatory Activity Of Microencapsulated Ethanolic Extract Of African Leaf (Vernonia Amygdalina Del.) In A Carrageenan-Induced Rat Paw Edema Model
7	Niken Mardiani	14.30	Antioxidant Activity and Cholesterol Inhibition of Extracts of Fresh Ketapang Leaves (Terminalia Catappa L.)
8	Siti Andena Nurfasya Hardani	14.40	Characterization Of Phenolic Compounds And Evaluation Of Antioxidant And Anticholesterol Activities Of Ketapang (Terminalia Catappa L.) Leaves
9	Jlhan	14.50	Students' Perceptions of Reflective Learning in Case-Based Self-Medication Practicum

No	Name	Time	Title
10	Sulthan Rafi Abyan Hidayat	15.00	An Open Geospatial Workflow for Hazard-Aware Crop Planning in a Volcanic Upland Village of Kediri, Indonesia
11	Mukhlisi	15.10	Vegetation Recovery Across Reclamation Ages n a Tropical Post-Coal Mine Landscape
12	Chorry Sundari Irawan	15.20	From Bean to Beauty: Innovative Yogurt-Based Clay Mask From Jack Bean and Kidney Bean
14	Taufik Muhammad Fakhri	15.40	Integrated Chemical Profiling, Network Pharmacology, and Molecular Docking Reveal The Antioxidant Potential of Ethanol Extract of Moringa Oleifera
15	Arcee Castro Tabing	15.50	Inoculation Test Of Representative Denitrifying Bacteria Isolated From Selected Paddy Rice Areas In Nueva Ecija And Pangasinan, Philippines On Rice (Oryza Sativa L. Rc222)
16	Rachela Titania Aradhty	16.00	Anti-Inflammatory Activity of Purple Leaf Tea (Graptophyllum Pictum) At Various Brewing Temperatures
17	Fahrezi Albar	16.10	Antihypertensive Activity and Preliminary Safety Evaluation Of Microencapsulated African Leaf Extract (Vernonia Amygdalina Delile)

ORAL PRESENTER ONLINE
GROUP B (MATH, COMPUTER SCIENCE)

Topic :

1. Artificial Intelligence and Data Science
2. Mathematical, Statistics, and Computational Science
3. Digital Technology, Education and Community Empowerment

Room : B

Duration : 70 minute

No	Name	Time	Title
1	Melani Faliana Putri	13.30	Design And Development Of An Android-Based Learning Management System: A Case Study Of Sma Ananda Bogor
2	Meilani Kizana	13.40	Design And Development Of An Android-Based Library Application With A Book Recommendation System At Sma Ananda Bogor
3	Asep Saepulrohman	13.50	Development And Validation Of A New Chaotic Jerk-Based Encryption Model For Blockchain-Based E-Voting Systems
4	Ainul Mardhiah Binti Khidzir	14.00	Towards An Adaptive Reuse Decision Framework For Government Quarters As Interim Rental Housing For Urban Civil Servants In Malaysia: A Preliminary Conceptual Study)
5	Yurika Permanasari	14.10	A Beyond the ESG Label: A Review and Machine Learning Framework for Clustering Indonesian Sustainable Stocks by Risk and Return
6	I Wayan Widiana	14.20	Gaussian Mixture Model-Based Clustering Of Gamma-Ray Signals Using Pulse Shape Discrimination Parameters
7	Fyndi Abdi Wibowo	14.30	Impact Of Timestamp Flag Selection During List-Mode Preprocessing On B- Γ Coincidence Activity Determination

**ORAL PRESENTER ONLINE
GROUP B (MATH, COMPUTER SCIENCE)**

Topic :

1. Artificial Intelligence and Data Science
2. Mathematical, Statistics, and Computational Science
3. Digital Technology, Education and Community Empowerment

Room : B1

Location : Meeting Room (2nd Floor)

Duration : 110 minute

No	Name	Time	Title
1	Dewi Suhika	13.30	Regulation Of Measles Transmission Dynamics Using Adaptive Sliding Mode Control
2	Amila Fadhila R	13.40	PCA-Based Clustering of Heavy Metal Pollution in Coastal Seawater for Risk Mapping: A Case Study from the North Coast of East Java
3	Mochamad Sidqi Ramdhani	13.50	Analysis Of Uncertainty In Gold Price Movements Using The Quantile Random Forest Method
4	Muhammad Syehan	14.00	Money Laundering Detection in Digital Financial Transactions Using Graph Neural Networks
5	Raihan Surya Parinduri	14.10	Intent Classification System For User Tweets Regarding Artificial Intelligence (Ai) On Platform X Using The Indobert Model
6	Raka Chandra Irawan	14.20	Comparative Analysis Of MobileNetV3 and Efficient-B0 For Mobile-Based Koi Fish Image Classification
7	Nasywa Aura Permata Hati	14.30	Application Of K-Means Clustering And K-Nearest Neighbors For Surface Color Determination In Hijab Fashion Recommendations
8	Muhamad Firgi Ramadhan	14.40	Implementation of Artificial Neural Network for IoT-Based Fire Detection in Timber Cutting Industries

No	Name	Time	Title
9	Andara Najla dan Yurika Permanasari	14.50	A Beyond the ESG Label: A Review and Machine Learning Framework for Clustering Indonesian Sustainable Stocks by Risk and Return
10	Yurika Permanasari	15.00	A Machine Learning Approach to Clustering Sustainable Stocks Based on Risk–Return Characteristics
11	I Wayan Sriyasa	15.10	Security Operations Center Alert Prioritization Based On Temporal And Entity Correlation Using Xgboost And Shap-Based Explainable Ai: A Case Study In A Banking Environment

ORAL PRESENTER ONLINE
GROUP B (MATH, COMPUTER SCIENCE)

Topic :

1. Artificial Intelligence and Data Science
2. Mathematical, Statistics, and Computational Science
3. Digital Technology, Education and Community Empowerment

Room : B2**Location : Meeting Room (2nd Floor)****Duration : 120 minute**

No	Name	Time	Title
1	Dear Michiko Mutiara Noor	13.30	Evaluating The Performance Of A Shallow Water Model For Tsunami Run-Up And Coastal Inundation At Way Muli, Indonesia
2	Rifky Fauzi	13.40	Semi-Analytical Estimation Of Extreme Wave Parameters For Coastal Run-Up And Tsunami Hazard Assessment
3	E.T. Hadi Saputra	13.50	Operationalizing Constitutional Ethics of modittery Eliminating Regulatory Lag in Green Technology Transitions
4	Aswan Anggun Pribadi	14.00	Analyzing The Structural Influence Of Lq45 Banks Before, During, And After The Covid-19 Pandemic: A Minimum Spanning Tree Forest Approach
5	Tiara Shofi Edriani	14.10	Spatio-Temporal Prediction Of Hotspot Occurrence Levels Based On Climate Factors In Lampung Using Multinomial Logistic Regression
6	Dini Suhartini	14.20	Synthesizing The Architecture Of A Knowledge-Based Decision Support System For Scientific And Biomedical Design Recommendations Using A Systematic Literature Review
7	Erniyati	14.30	Applicstion of Neural Network in a Chatbot for Boutique Services

No	Name	Time	Title
8	Yani Lukmayani	14.40	Machine Learning-Based Prediction of Antioxidant Activity in Seaweed from Phytochemical Profiles
9	Puspa Citra	14.50	Context-Aware Spatial Interaction Model in Augmented Reality E-Modules for Ethno-STEAM
10	Rahmi Rismayani Deri, S.Psi., MT	15.00	Anthropometric Design And Concept Selection Of An Esp32-Based Weighing Trolley For Manual Sack Handling
11	Hagni Wijayanti	15.10	Budgeted Robust Goal Programming for Vehicle Routing: One Dual per Route and a Bus Rapid Transit Case Study
12	Reza Ariyanto	15.20	Design And Development Of An Iot-Based Early Warning System (Ews) Using The Tsukamoto Fuzzy Method In The Pelabuhan Ratu Coastal Area

ANALYTICAL EVALUATION AND PROTOTYPE DEVELOPMENT OF A CELERY-EMPRIT GINGER HERBAL ANTI-DANDRUFF SHAMPOO

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ABSTRACT

The development of herbal anti-dandruff shampoos requires evaluation of their chemical composition, formulation quality, biological activity, and safety. This study evaluated shampoo formulations containing celery (*Apium graveolens*) and emprit ginger (*Zingiber officinale* var. *amarum*) through LC-MS/HRMS profiling, physicochemical characterization, anti-*Malassezia* activity, acute dermal irritation testing, and ICP-OES elemental screening.

Four formulations were investigated: F1 and F2 without fragrance and F1P and F2P containing jasmine fragrance. F1 demonstrated the most favorable overall performance, with a pH of 5.49 ± 0.05 , viscosity of 242.3 ± 0.42 cP, foam retention of $94.36 \pm 0.18\%$, and an inhibition zone of 17.60 mm against *Malassezia* sp., compared with 18.80 mm for 2% ketoconazole. Jasmine fragrance generally reduced foam formation and antifungal activity.

LC-MS/HRMS tentatively identified (+)-ar-turmerone, (-)-caryophyllene oxide, (2E)-nonenal, and (2E)-decanoic acid as chemical markers in emprit ginger. ICP-OES showed that As, Hg, Cd, and Pb in F1 were below detection limits, while acute dermal testing revealed no edema.

Overall, F1 exhibited the most balanced physicochemical properties, antifungal activity, and safety profile, supporting its potential as a herbal anti-dandruff shampoo.

DESIGN AND DEVELOPMENT OF AN ANDROID-BASED LEARNING MANAGEMENT SYSTEM: A CASE STUDY OF SMA ANANDA BOGOR

Melani Faliana Putri 1,* , Ade Mulyana 2 , and Yanto Hermawan 3

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ABSTRACT

Technological advancements in education have encouraged the use of Android devices as learning media. However, the learning process at SMA Ananda Bogor is still conducted manually, resulting in lengthy grade recapitulation (3–7 days) and exam question preparation (up to a month), which impacts teacher performance. Furthermore, previous research has not optimized learning management systems to support Artificial Intelligence (AI) based question preparation, necessitating the development of a system capable of addressing these issues.

This research aims to design and develop an Android-based learning management system that can accelerate the process of grade recapitulation automatically, accurately, and structured, as well as provide AI based exam question and answer recommendations to assist teachers in compiling questions more quickly.

This research was conducted at SMA Ananda Bogor. The method used is Feature Driven Development (FDD) which focuses on developing features according to user needs, by utilizing Android Studio and Supabase technology.

The research results show that the designed system is capable of providing a grade recapitulation feature in Excel format based on class and subject, as well as AI based recommendations for multiple choice and essay exam questions and answers. Thus, the Android-based learning management system can assist teachers in accelerating the automatic grade recapitulation process with accurate and organized results and supporting faster exam question preparation through the use of AI.

Comperence Scop

Computer Science, Information Systems, and Smart Technology

Keywords

Learning Management System; Android; Artificial Intelligence

DESIGN AND DEVELOPMENT OF AN ANDROID-BASED LIBRARY APPLICATION WITH A BOOK RECOMMENDATION SYSTEM AT SMA ANANDA BOGOR

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ABSTRACT

Education is one of the main foundations to improve the quality of human resources, supported by literacy skills. Literacy encompasses not only reading and writing skills but also critical thinking, understanding information, and evaluating and processing knowledge. School libraries are an important resource for supporting literacy levels among students. SMA Ananda Bogor has a school library facility that students can use to read and borrow books. However, the library utilization rate remains low because students struggle to search and locate books. In addition, the librarian faces challenges in data management, particularly in ensuring the number and availability of books and the number of transactions. This study aims to overcome these challenges by developing a library system, an Android-based application for students and a website for the librarian. The system was developed using the Rapid Application Development (RAD) method, with data obtained through observation and interviews. Currently, the developed system manages a collection of 290 books and provides features such as book search, borrowing, and content-based filtering book recommendations. The developed application simplifies the book search process from five steps (5 to more than 20 minutes) to four steps, enabling faster access to book information. Functional testing showed that all features operated successfully with a 100% success rate. While user evaluation using the Likert scale score more than 4, indicates positive user acceptance. The results indicate that the system improves accessibility to library services for students and supports more structured management of books, members, transactions, and suggestions data for the librarian.

Comperence Scop

Computer Science, Information Systems, and Smart Technology

Keywords

Android application; library website; rapid application development; recommendation system; school library

GREEN SYNTHESIS OF NANO-HYDROXYAPATITE FROM Meretrix meretrix SHELL WASTE USING SONICATION METHOD: STRUCTURAL AND FUNCTIONAL CHARACTERIZATION

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ABSTRACT

Shell waste from Meretrix meretrix, a common edible clam, represents an abundant and underutilized calcium source with strong potential for valorization into biomedical-grade calcium phosphate ceramics. X-ray fluorescence (XRF) confirmed the shell's suitability as a calcium precursor, revealing a dominant CaO content of 98.314%, with only trace impurities including SiO₂ (0.205%), P₂O₅ (0.291%), SrO (0.451%), and Fe₂O₃ (0.091%), indicating high purity relative to synthetic calcium sources.

X-ray diffraction (XRD) elucidated the phase transformation pathway across three stages: the raw shell exhibited a crystallized aragonite phase (PDF 75-2230) with crystallite sizes of 24.71–45 nm; calcination converted this into a lime (CaO) phase (PDF 81-2027) with crystallite sizes of 37.22–68.90 nm, alongside residual calcite from incomplete decomposition; and hydration produced portlandite, Ca(OH)₂ (PDF 87-0673), with a refined crystallite size of 10.14–25.29 nm, indicating renucleation into finer domains.

Unlike prior shell-valorization studies reporting phase identity alone, this work is among the first to quantitatively track crystallite-size evolution across the entire CaCO₃-to-CaO-to-Ca(OH)₂ pathway for Meretrix meretrix, establishing a nanostructural rationale for its use as a hydroxyapatite precursor via a sonochemical route rarely applied to this species.

The synthesized nano-hydroxyapatite exhibited a crystallite size of 24.97 nm, confirming successful formation of a nanostructured apatite phase, and was characterized by FTIR, confirming phosphate (PO₄³⁻) bands at 1039.63, 962.48, 605.65, and 569.00 cm⁻¹, hydroxyl bands at 3566.38 and 3448.72 cm⁻¹, and minor carbonate substitution bands near 1421–1458 cm⁻¹ typical of biogenic B-type carbonated apatite.

Collectively, the high purity, favorable crystallite evolution, and confirmed apatitic groups demonstrate that Meretrix meretrix shell waste is a promising, sustainable precursor for green nano-hydroxyapatite synthesis with biomedical applications.

Comperence Scop

Computer Science, Information Systems, and Smart Technology

Keywords

android application; library website; rapid application development; recommendation system; school library

VEGETATION RECOVERY ACROSS RECLAMATION AGES IN A TROPICAL POST-COAL MINE LANDSCAPE

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ABSTRACT

Coal mine reclamation is widely implemented to re-establish vegetation following mining disturbance, but recovery trajectories may vary with reclamation age and site conditions. This study evaluated vegetation recovery patterns across four reclamation-age classes (7, 9, 12, and 15 years), using a nearby relatively intact dipterocarp forest as a reference ecosystem in East Kalimantan, Indonesia.

Vegetation recovery was assessed using species richness, stand structure, community composition, and similarity to the reference forest, while soil properties were examined for their associations with community composition. Vegetation recovery showed a non-monotonic pattern, with species richness and basal area reaching higher values at intermediate reclamation ages but declining at the oldest age.

Stand structure remained dominated by planted fast-growing species, whereas unplanted species, particularly *Vitex pinnata* and *Melicope glabra*, became important components of stand structure in the oldest reclamation class. This class also had a higher proportion of grasses and ferns and lower basal area, suggesting that limited woody regeneration may constrain continued stand development.

NMDS showed clear separation between reclamation communities and the reference forest, while community composition was associated with available K, total N, organic C, and pH. PERMANOVA indicated significant differences among groups ($R^2 = 0.418$; $p = 0.001$). Bray-Curtis similarity to the reference forest remained low and varied non-monotonically across the reclamation-age gradient.

These findings indicate that reclamation age alone is not an adequate proxy for vegetation recovery, and the oldest reclamation class showed signs of constrained vegetation development.

Keywords

coal mine reclamation; vegetation recovery; chronosequence; community composition; reference forest

DECISION TREE-BASED FOR GUIMARAS MANGO VARIETY CLASSIFICATION USING J48 ALGORITHM

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ABSTRACT

Guimaras mango is the Philippines' premier agricultural product and the country's first officially recognized Geographical Indication (GI) product. It comprises numerous varieties, each exhibiting distinct fruit characteristics despite having similar visual appearances. Therefore, a systematic classification approach is required to facilitate accurate differentiation among these mango varieties.

This study aimed to develop a classification model for Guimaras mango varieties to enable faster and more reliable identification. The research employed a decision tree-based classification approach using the J48 algorithm.

The results showed that peel color served as the primary splitting attribute (root node), indicating that it is the most influential characteristic for distinguishing among Guimaras mango varieties. In subsequent branches, the classification process was further determined by flesh color and fruit weight. Each path in the decision tree produced a prediction for a specific mango variety, including BPI Golden Pico, Talaban, Guimaras Super Galila, Fresco, JTA Sweet, and several other varieties.

These findings demonstrate that the combination of peel color, flesh color, and fruit weight provides an effective basis for classifying Guimaras mango varieties using the J48 algorithm.

Keywords

decision tree; Guimaras; J48 algorithm; mango; machine learning; variety classification

SOLVENT-DEPENDENT α -GLUCOSIDASE INHIBITION BY ULTRASOUND-ASSISTED EXTRACTS AND FRACTIONS OF *MITRAGYNA SPECIOSA* (KORTH.) HAVIL. LEAVES FROM WEST KALIMANTAN, INDONESIA, AND THEIR LC-HRMS METABOLITE PROFILES

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ABSTRACT

Inhibiting intestinal α -glucosidase lowers postprandial hyperglycaemia in type 2 diabetes. Kratom (*Mitragyna speciosa*) leaves are used for diabetes in Kalimantan, but how extraction solvent and fractionation shape this activity, and which constituents accompany it, remain unclear.

Leaf powder was extracted by ultrasound-assisted extraction (UAE; 40 kHz, 40 °C, 3 × 20 min) with 70% (E70) or 96% ethanol (E96). E96 was partitioned into n-hexane (F-Hx), ethyl acetate (F-EA) and aqueous (F-Aq) fractions. Inhibition of yeast α -glucosidase was measured with p-nitrophenyl- α -D-glucopyranoside (pH 6.8, 37 °C, 405 nm), with acarbose as reference. Concentration–response models were compared by AIC; IC₅₀ values from the best model were compared by one-way ANOVA with Tukey's HSD test after normality and homoscedasticity checks. E70 and F-Aq were profiled by UHPLC–Orbitrap HRMS (ESI+).

All samples inhibited α -glucosidase. A three-parameter logistic model with a free lower asymptote fitted far better than a two-parameter Hill model ($R^2 \geq 0.986$; Δ AIC 18–95). IC₅₀ values differed among samples (one-way ANOVA, $F(5,12) = 3070.0$, $p < 0.001$, $\eta^2 = 0.999$): E70 48.88 ± 0.50 μ g/mL, F-Aq 61.08 ± 0.68 , E96 67.86 ± 0.89 , F-EA 83.98 ± 0.94 and F-Hx 88.13 ± 0.99 (all pairwise $p < 0.001$); acarbose gave 23.26 ± 0.12 μ g/mL. Extracts already produced 42–48% inhibition at the lowest concentration, and a significant sample × concentration interaction (two-way ANOVA, $p < 0.001$) showed that rank order changed at 500 μ g/mL. Mitragynine accounted for 68.0% of the E70 peak area, whereas F-Aq was enriched in rutin, kaempferol-3-O-rutinoside, caffeoylquinic acid and 5-carboxystrictosidine (flavonoids 13.8% vs 3.4%).

Aqueous ethanol (70%) is the preferred UAE solvent for α -glucosidase inhibitors from kratom leaves. Activity concentrated in the polar fraction alongside flavonol glycosides, suggesting that constituents other than mitragynine contribute and warrant bioassay-guided isolation.

Keywords: α -glucosidase; kratom; LC-HRMS; mitragynine; flavonol glycosides; ultrasound-assisted extraction

ANALYSIS OF PRE-ANALYTICAL FACTORS ON THE STABILITY OF GLUCOSE AND TOTAL BILIRUBIN TEST RESULTS BASED ON TUBE TYPE AND DELAYED TESTING TIME

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ABSTRACT

The pre-analytical phase is an important factor affecting the accuracy of laboratory test results, particularly for random blood glucose and total bilirubin measurements. This study aimed to analyze the effects of tube type, specimen separation treatment, and testing delay on the stability of random blood glucose and total bilirubin levels.

A laboratory-based experimental study with a quantitative approach was conducted involving six respondents. Samples were collected using plain and NaF tubes for random blood glucose analysis and plain and lithium heparin tubes for total bilirubin analysis. Measurements were performed immediately, after 3 hours, and after 5 hours of delay, with specimens either separated or not separated from blood cells. Glucose levels were measured using the GOD-PAP method with a Microlab LX-300 analyzer, while total bilirubin was measured using the Jendrassik-Grof method. Data were analyzed using the Shapiro-Wilk, Friedman, and Wilcoxon tests.

The results showed that random blood glucose levels tended to decrease with increasing delay in testing, particularly in samples that were not separated from blood cells. Total bilirubin levels showed fluctuating changes during the testing delay. The Friedman test demonstrated significant differences in several treatment groups, with $p < 0.05$.

This study concludes that testing delays and specimen handling affect the stability of random blood glucose and total bilirubin levels. Immediate separation of serum or plasma from blood cells after blood collection was found to be more effective in maintaining analyte stability and minimizing pre-analytical errors.

Keywords

Pre-analytical factors; Random blood glucose; Total bilirubin; Specimen stability; Tube type; Testing delay.

Conference Scope

Pharmaceutical Sciences, Natural Products, and Health Innovation

SECURITY OPERATIONS CENTER ALERT PRIORITIZATION BASED ON TEMPORAL AND ENTITY CORRELATION USING XGBOOST AND SHAP-BASED EXPLAINABLE AI: A CASE STUDY IN A BANKING ENVIRONMENT

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ABSTRACT

Security Operations Center (SOC) analysts routinely face alert volumes that exceed the time available for investigation, while severity labels assigned by security tools do not always reflect the need for operational escalation. This study develops an explainable alert-prioritization approach using 8,613 Security Information and Event Management (SIEM) alerts and 181 SOC tickets collected from an anonymized banking environment between January and June 2026.

Because the ticket labels were highly imbalanced for direct multi-class severity modeling, the target was defined as the probability that an alert would lead to a SOC ticket. Detection context, network attributes, and temporal/entity features were derived from 5-, 15-, and 30-minute windows using only events observed before each alert. XGBoost generated the escalation-priority score, while SHAP provided the Explainable Artificial Intelligence layer for interpreting feature contributions.

On the June temporal holdout, XGBoost achieved a precision-recall area under the curve of 0.9701 and a receiver operating characteristic area under the curve of 0.9922. Prioritizing the top 5% of alerts captured 50 of 52 tickets, with 98.04% precision and 96.15% recall. Monthly walk-forward validation, however, produced precision-recall area-under-the-curve values from 0.1181 to 0.9701, revealing substantial temporal variation.

The findings show that temporal and entity context can add useful information beyond native SIEM severity, but the learned ranking is sensitive to changes in ticketing practice and SOC workflow. The model should therefore be treated as analyst decision support for investigation-queue ranking rather than as an autonomous escalation or cyber-risk scoring mechanism.

Keywords: Security Operations Center; alert prioritization; XGBoost; explainable artificial intelligence; temporal correlation

Conference Scope: Artificial Intelligence, Data Science, and Digital Technology

IDEAL: AN INTEGRATED DATA ENGINEERING, ANALYTICS AND LEARNING LIFECYCLE FRAMEWORK FOR INTELLIGENT FOOD PRICE RECOMMENDATION

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ABSTRACT

Developing intelligent decision support systems requires more than accurate analytical models; it also requires an integrated lifecycle that connects data engineering, knowledge discovery, artificial intelligence, optimization, system development, and continuous evaluation. However, these activities are commonly addressed through separate methodologies, creating fragmentation between data preparation, model development, knowledge generation, and operational system implementation.

This study proposes IDEAL (Integrated Data Engineering, Analytics, and Learning Lifecycle), a unified framework for developing adaptive intelligent systems. IDEAL integrates Extract–Transform–Load (ETL), Knowledge Discovery in Databases (KDD), artificial intelligence lifecycle principles, and the System Development Life Cycle (SDLC) into six interconnected phases: Planning and Data Acquisition, Data Preparation, Data Management and AI Design, Intelligence Analytics, System Design and Development, and System Evaluation and Deployment. Five feedback mechanisms are incorporated to support iterative refinement of data, analytical models, knowledge, system components, and requirements.

The framework is demonstrated through the development of an intelligent food price recommendation system using historical food price data and stakeholder knowledge. Its implementation combines a dual-loop ETL mechanism, predictive models, the Smart Reading Algorithm for adaptive model selection, and a Smart Pricing Model solved using Particle Swarm Optimization to transform price forecasts into actionable recommendations. The resulting web-based system integrates database, knowledge-base, model-base, and user-interface components within a single decision-support environment. Functional evaluation confirms that the integrated components operate according to the specified requirements.

The study demonstrates that IDEAL provides a structured and iterative lifecycle for bridging data engineering, artificial intelligence analytics, optimization, and system implementation, with potential applicability to other data- and knowledge-driven intelligent decision support problems.

Keywords: IDEAL Framework; Food Price Recommendation; optimization.

Conference Scope: Artificial Intelligence, Data Science, and Digital Technology

COMPARATIVE CLINICAL OUTCOMES OF ANTIPSYCHOTIC REGIMENS IN OUTPATIENTS WITH SCHIZOPHRENIA: A PROSPECTIVE COHORT STUDY IN INDONESIA

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ABSTRACT

Schizophrenia is a chronic psychiatric disorder characterized by positive, negative, and cognitive symptoms, with antipsychotic medications remaining the mainstay of pharmacological treatment. However, clinical response varies among patients receiving different antipsychotic regimens, and prospective comparative evidence from outpatient settings in Indonesia remains limited.

This study aimed to compare changes in clinical symptoms among outpatients with schizophrenia receiving first-, second-, and third-generation antipsychotic regimens using the Positive and Negative Syndrome Scale (PANSS). A prospective observational cohort with a pre-post design was conducted at an outpatient psychiatric clinic in Indonesia, enrolling 90 patients categorized by antipsychotic regimen, with 30 patients in each generation group. PANSS scores were assessed at baseline and after three months.

Between-group differences were analyzed using the Kruskal-Wallis test with Holm-corrected pairwise comparisons, within-group change using the Wilcoxon signed-rank test, and multivariable linear regression was used to examine the association between antipsychotic generation and PANSS change after adjusting for age, sex, and baseline PANSS score.

All three groups showed significant reductions in PANSS scores after three months, with mean reductions of 14.00 ± 8.25 , 15.93 ± 8.63 , and 18.80 ± 6.55 points in the first-, second-, and third-generation groups, respectively. The magnitude of reduction differed significantly among groups (Kruskal-Wallis, $p = 0.008$), with a significant difference between the first- and third-generation groups after Holm correction ($p = 0.0037$), while other pairwise comparisons were not significant.

In multivariable analysis, the third-generation group remained significantly associated with greater PANSS reduction than the first-generation group ($B = 6.457$; 95% CI, 2.204–10.710; $p = 0.003$).

PANSS scores improved significantly across all three antipsychotic generation groups, with a greater observed reduction in the third-generation group than the first-generation group. However, given the observational design and potential for residual confounding, these findings should be interpreted as an association rather than evidence of causal superiority.

Keywords: schizophrenia; antipsychotic; PANSS; clinical outcomes; prospective cohort

Conference Scope: 6. Pharmaceutical Sciences, Natural Products, and Health Innovation

IN SILICO SCREENING OF FLAVONOIDS AGAINST PARKINSON'S DISEASE-RELATED TARGETS: MOLECULAR DOCKING, ADMET PREDICTION, AND MOLECULAR DYNAMICS SIMULATIONS

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ABSTRACT

Flavonoids offer a chemically diverse starting point for identifying compounds that interact with Parkinson's disease-related targets. This study screened 100 flavonoids against the dopamine D2 receptor, monoamine oxidase B, and catechol-O-methyltransferase using molecular docking, absorption, distribution, metabolism, excretion, and toxicity (ADMET) prediction, and molecular dynamics simulations.

Docking was performed using AutoDock Vina with structures 6CM4, 2V5Z, and 3BWM, respectively. Native-ligand redocking yielded root-mean-square deviations below 2 Å. Drug-likeness was assessed using Lipinski's rule of five, pharmacokinetic and toxicity properties were predicted using pkCSM and Toxtree, and selected complexes underwent 100 ns simulations in Desmond.

Seventy-five compounds satisfied the drug-likeness criteria. Daidzin, silibinin, and fisetin produced the most favorable docking scores for the respective targets, at -10.34, -11.00, and -7.58 kcal/mol, compared with -6.18, -6.92, and -6.80 kcal/mol for pramipexole, selegiline, and entacapone. Predicted intestinal absorption was 59.3%, 61.9%, and 83.8%, respectively; however, all three compounds showed limited predicted blood-brain barrier penetration and were assigned to Cramer class III.

During molecular dynamics simulations, daidzin and silibinin exhibited comparatively stable profiles, whereas fisetin showed substantial fluctuations. These findings prioritize daidzin and silibinin for further investigation as computational hits, while highlighting brain exposure and toxicity as development constraints.

Experimental binding and functional assays are required to establish target activity, particularly dopamine receptor agonism, alongside pharmacokinetic and safety validation before therapeutic relevance can be determined.

Keywords: Parkinson's disease; flavonoids; molecular docking; ADMET prediction; molecular dynamics

PATIENTS' PERSPECTIVES ON TUBERCULOSIS TREATMENT NON-ADHERENCE IN INDONESIA: AN IN-DEPTH QUALITATIVE EXPLORATION

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ABSTRACT

Treatment non-adherence among pulmonary tuberculosis (TB) patients remains a major challenge contributing to treatment failure, relapse, prolonged infectiousness, and multidrug-resistant tuberculosis (MDR-TB). However, theory-informed qualitative evidence regarding patients' experiences and perceptions in Indonesia remains limited. This study aimed to explore factors influencing treatment non-adherence among pulmonary TB patients in Indonesia using the Health Belief Model (HBM) framework.

A qualitative exploratory study was conducted among adult pulmonary TB patients identified as having indications of treatment non-adherence. Participants were recruited using purposive sampling from one public and one private hospital in Jakarta, Indonesia. Data were collected through semi-structured in-depth interviews and analyzed using thematic analysis. Emerging themes were interpreted according to HBM constructs.

A total of 11 pulmonary TB patients participated in the study. Six interconnected themes influencing treatment non-adherence were identified, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. Participants described treatment non-adherence as being influenced by environmental vulnerability, fear of relapse and death, treatment side effects, emotional distress, financial hardship, healthcare access difficulties, and fluctuating confidence during prolonged therapy. Social support, therapeutic trust, clear communication with healthcare professionals, and observable recovery experiences supported treatment continuation.

Treatment non-adherence among pulmonary TB patients was influenced by emotional distress, treatment burden, medication side effects, financial hardship, and healthcare access difficulties. Patient-centered adherence interventions emphasizing emotional support, medication counseling, side-effect management, and effective therapeutic communication may help improve long-term treatment adherence.

Keywords: Tuberculosis; medication non-adherence; patients' perspectives; Health Belief Model

Conference Scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

THE RELATIONSHIP BETWEEN DOCTOR'S PRESCRIPTION WAIT TIMES AND PATIENT SATISFACTION AT DJATINEGARA PHARMACY IN EAST JAKARTA

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ABSTRACT

Pharmaceutical services aim to improve the quality of pharmaceutical care, ensure legal certainty for pharmacy professionals, and protect patients from the irrational use of medication for the sake of patient safety. Patient satisfaction is a key indicator of service quality at Djatinegara Pharmacy in East Jakarta, and is essential for attracting more patients. To deliver superior service, the pharmacy must minimize prescription-filling wait times. In December 2025, several patient complaints regarding long prescription processing times appeared on Google Reviews and WhatsApp.

This study used a quantitative approach with a cross-sectional analytic survey design. Purposive sampling yielded 257 respondents, calculated using the Slovin formula with a 5% tolerance limit from an average population of 723 prescriptions per month. Data were collected using a 4-point Likert-scale questionnaire tested for validity and reliability; 25 items were valid ($r > 0.361$), with a Cronbach's Alpha of 0.942 (> 0.60), confirming reliability. Data analysis included univariate and bivariate analysis using the Chi-Square test at $\alpha = 0.05$. The independent variable was doctor's prescription wait time; the dependent variable was patient satisfaction, measured through five SERVQUAL dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibles.

Univariate analysis showed all satisfaction dimensions fell into the "Very Satisfied" category; overall, 47.9% of respondents were very satisfied, while 80.5% of wait times were "Acceptable". The Chi-Square test showed $p = 0.001$ ($p < 0.05$), so H1 was accepted: there is a significant relationship between prescription wait time and patient satisfaction at Djatinegara Pharmacy, East Jakarta. The closer wait times comply with the established standard, the higher patient satisfaction and loyalty toward the pharmacy.

Keywords: Patient Satisfaction; Pharmaceutical Services; Pharmacy; Prescription Wait Time; SERVQUAL

Conference Scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

GREEN SYNTHESIS AND BIOLOGICAL EVALUATION OF PERSICARIA ODORATA-MEDIATED SILVER NANOPARTICLES

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ABSTRACT

Plant-mediated synthesis offers an aqueous route to produce silver nanoparticles, but antibacterial performance must be evaluated alongside cellular responses. This study investigated the synthesis, physicochemical characteristics, antibacterial activity, and in vitro cytotoxicity of silver nanoparticles prepared using *Persicaria odorata* leaf extract. An aqueous extract was prepared by heating leaf powder in deionized water at 100 °C for 20 min. The extract was mixed with 1 mM silver nitrate solution at a 1:9 volume ratio and incubated at room temperature for 24 h. The resulting nanoparticles were characterized using ultraviolet–visible spectroscopy, electron microscopy, dynamic light scattering, and X-ray diffraction. Antibacterial activity was assessed by disc diffusion against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, while cell viability was evaluated in human skin fibroblasts after 24 h of exposure.

Nanoparticle formation was supported by a surface plasmon resonance peak at 440 nm. Transmission electron microscopy revealed predominantly spherical to quasi-spherical particles with a mean diameter of 20.74 ± 5.59 nm. The hydrodynamic Z-average diameter was 73.65 nm, with a polydispersity index of 0.270, and diffraction analysis supported the presence of face-centred cubic silver. At 1.00 mg/mL, inhibition zones measured 10.67 ± 0.58 mm against *S. aureus* and 11.33 ± 0.58 mm against *P. aeruginosa*. However, fibroblast viability decreased with increasing concentration, reaching approximately 62% at 0.031 mg/mL. These findings demonstrate the potential of *P. odorata*-mediated silver nanoparticles for antibacterial material development, while highlighting the need for dose optimization and further safety assessment before biomedical application.

Keywords: *Persicaria odorata*; silver nanoparticles; green synthesis; antibacterial activity; cytotoxicity

Conference Scope: Green Chemistry, Sustainable Materials, and Environmental Analysis

Presentation Type: Poster Presentation

CHARACTERIZATION OF A MYRISTIC ACID–TETRABUTYLAMMONIUM BROMIDE MIXTURE AS A POTENTIAL DEEP EUTECTIC SOLVENT (DES) FOR GREENER SOLVENT DESIGN

Hidawati¹

ABSTRACT

Deep eutectic solvents (DES) are a class of non-volatile solvents formed by mixing hydrogen bond donors (HBD) and hydrogen bond acceptors (HBA). Over the past decade, these solvents have garnered attention as alternatives that align with Green Chemistry principles, offering a significant approach to reducing reliance on conventional organic solvents. This study aimed to synthesize and characterize a DES based on tetrabutylammonium bromide (TBAB) and myristic acid (MA) as an environmentally friendly solvent candidate.

The DES was synthesized by heating and stirring the components until a stable, homogeneous liquid phase was obtained; subsequently, its physicochemical properties—such as melting point, boiling point, density, viscosity, and the nature of the hydrogen bonding interactions—were characterized. FTIR results revealed band shifts at wavenumbers 3300, 1693, 1301, and 937 cm⁻¹, indicating interactions between the functional groups of TBAB and MA. DSC analysis showed that the DES eutectic point was lower than those of the individual constituent components and the ideal eutectic point. These findings demonstrate the potential of the TBAB–MA system as a solvent alternative that can be further developed through Green Chemistry and Green Solvent Design approaches.

Keywords: green chemistry; green solvent design; deep eutectic solvent; tetrabutylammonium bromide; myristic acid.

DEVELOPMENT OF A HYBRID ANT COLONY OPTIMIZATION ALGORITHM WITH 2-OPT LOCAL SEARCH BASED ON WEATHER FORECASTING FOR MULTI-DESTINATION TOURIST ROUTE OPTIMIZATION IN GREATER BOGOR

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ABSTRACT

Multi-destination travel planning is an optimization problem that requires determining an efficient visiting sequence while considering travel distance and weather conditions. Previous research developed a tourist destination recommendation system for Greater Bogor by integrating a Recurrent Neural Network (RNN) model, the Composite Performance Index (CPI) method, and the Ant Colony Optimization (ACO) algorithm. In the weather forecasting model evaluation using a 70:30 training-test split, the Root Mean Squared Error (RMSE) was 0.625 °C and the Mean Absolute Error (MAE) was 0.493 °C for temperature prediction, while rainfall prediction yielded an RMSE of 7.341 mm and an MAE of 5.015 mm. Initial ACO testing also demonstrated the potential to reduce travel distance and time in one travel scenario, although a discrepancy was observed between the system's distance estimate and Google Maps. Based on these findings, this research aims to develop a Hybrid Ant Colony Optimization algorithm with 2-Opt Local Search that integrates weather forecast information into multi-destination tourist route optimization. ACO is used to generate candidate routes based on pheromone information and heuristic values, while 2-Opt improves the visiting sequence using an objective function that considers total travel distance and penalties for unfavorable weather conditions. The proposed method is evaluated by comparing standard ACO, ACO with 2-Opt, and the hybrid method incorporating weather information. Performance evaluation includes total route distance, objective function value, computation time, and solution stability. Further experimental testing is required to determine the contributions of 2-Opt and weather integration to the quality of the resulting routes. This research is expected to contribute to the development of a tourist travel recommendation system that optimizes routes while taking weather conditions in Greater Bogor into account.

Keywords: Ant Colony Optimization; Hybrid ACO; 2-Opt Local Search; weather forecasting; tourist route optimization

FROM BEAN TO BEAUTY: INNOVATIVE YOGURT-BASED CLAY MASK FROM JACK BEAN AND KIDNEY BEAN

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ABSTRACT

Jack bean and kidney bean are legumes containing bioactive compounds with potential antioxidant activity. Combining these legumes into yogurt may provide an alternative active ingredient for clay masks due to their phenolic and flavonoid compounds. This study aimed to determine yogurt antioxidant activity, obtain the optimum clay mask formulation, and evaluate its physical characteristics, stability, and safety.

A completely randomized design was used, comprising three temperatures, four formulations, three replications, and four observation times. Yogurt was prepared from jack bean and kidney bean extracts (60:20 mL) and formulated at 0% (F0), 3% (F1), 5% (F2), and 7% (F3). Each formulation was prepared in triplicate and tested at 4°C, 25°C, and 40°C for 21 days, with observations in weeks 0, 1, 2, and 3. Evaluations included organoleptic properties, homogeneity, pH, viscosity, spreadability, adhesion, drying time, and physical stability. Antioxidant activity was determined using the DPPH method by UV-Vis spectrophotometry, while safety was evaluated using an open patch test in 30 panelists, with observations at 0, 24, and 48 hours. Data were analyzed using One-Way ANOVA or Kruskal-Wallis according to data distribution at a 95% confidence level ($\alpha = 0.05$).

The yogurt showed very strong antioxidant activity (IC₅₀ 46.84 ppm). Among the formulations, F1 was selected as the optimum based on physical characteristics, stability, antioxidant activity, and safety, showing strong antioxidant activity (IC₅₀ 61.84 ppm), pH 5.15–5.43, and viscosity 15,730–19,960 cPs. No panelists showed signs of irritation with any formulation. Further research should evaluate the formulation's efficacy and long-term stability.

SECONDARY METABOLITE CHARACTERIZATION AND ANTI-MYCObACTERIAL ACTIVITY OF THE ENDOPHYTIC FUNGUS ARK-1028-B2

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ABSTRACT

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a major global health challenge, highlighting the need for new anti-mycobacterial agents. Endophytic fungi are promising sources of structurally diverse secondary metabolites with potential pharmaceutical applications, but their metabolite production and biological activity can vary with cultivation conditions. This study aimed to identify and characterize the anti-mycobacterial endophytic fungus ARK-1028-B2, evaluate its secondary-metabolite profiles and biological activity under different cultivation conditions, and investigate the distribution of anti-mycobacterial activity among its chromatographic fractions. The fungal isolate was identified based on morphological characteristics and internal transcribed spacer (ITS) sequence analysis. ARK-1028-B2 was cultivated in yeast extract sucrose, potato dextrose broth, and Czapek media, followed by evaluation of biomass production, extract yield, metabolite profiles, and anti-mycobacterial activity. The most active extract was subsequently subjected to several chromatographic separation techniques, and the resulting fractions were evaluated for metabolite profiles and anti-mycobacterial activity. ARK-1028-B2 was identified as *Fusarium solani*, and cultivation conditions produced distinct metabolite profiles as observed by thin-layer chromatography. Anti-mycobacterial activity varied among the extracts, with the potato dextrose broth extract showing the strongest activity against *Mycobacterium bovis* BCG, with a half-maximal inhibitory concentration (IC_{50}) of 8.9 $\mu\text{g/mL}$, compared with 27.9 $\mu\text{g/mL}$ for the yeast extract sucrose extract and 24.3 $\mu\text{g/mL}$ for the Czapek extract. Chromatographic separation further resolved the metabolite profile of the potato dextrose broth extract and revealed differences in anti-mycobacterial activity among the resulting fractions, providing a basis for prioritizing bioactive fractions for subsequent chemical characterization and identification of candidate anti-mycobacterial metabolites.

Keywords: endophytic fungus; ARK-1028-B2, *Fusarium solani*, anti-mycobacterial activity

Conference Scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation Type: Oral Presentation

SOL-GEL SYNTHESIS OF HYDROXYAPATITE FROM PENSI CLAM SHELL WASTE FOR CR(VI) ADSORPTION

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ABSTRACT

The utilization of calcium-rich shell waste as a precursor for functional materials offers a promising approach for both waste valorization and environmental remediation. This study investigated the synthesis of hydroxyapatite (HAp) from pensi clam shell waste (*Corbicula moltkiana*) using a sol-gel method and evaluated its potential for Cr(VI) adsorption. The clam shells were converted into a calcium precursor through calcination and hydration before reacting with phosphoric acid under alkaline conditions.

The resulting material was characterized by Fourier-transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD). The FTIR spectrum exhibited characteristic bands associated with phosphate, hydroxyl, and carbonate groups, with prominent absorptions at 1021.3, 3265.1, 1416.4, and 872.2 cm^{-1} . The XRD pattern showed several characteristic crystalline reflections, with the most intense peak observed at $2\theta = 31.902^\circ$, supporting the formation of a hydroxyapatite-containing calcium phosphate phase. The material exhibited a partially crystalline structure, with an estimated crystallinity of 63.6%.

The adsorption performance toward Cr(VI) was investigated under varying pH, contact time, adsorbent dosage, and initial Cr(VI) concentration. Within the investigated conditions, the highest adsorption capacities were obtained at pH 6 (2.998 mg/g), 90 min contact time (3.962 mg/g), and an adsorbent dosage of 0.1 g (2.998 mg/g), while an initial Cr(VI) concentration of 250 mg/L resulted in a removal efficiency of 69.04%. These findings demonstrate the potential of pensi clam shell waste as an alternative calcium source for preparing HAp-containing calcium phosphate materials for use in Cr(VI)-contaminated aqueous systems.

Keywords: hydroxyapatite; *Corbicula moltkiana*; clam shell waste; sol-gel synthesis; Cr(VI); adsorption

Conference Scope: Green Chemistry and Sustainable Materials

Presentation Type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

ANALYZING THE STRUCTURAL INFLUENCE OF LQ45 BANKS BEFORE, DURING, AND AFTER THE COVID-19 PANDEMIC: A MINIMUM SPANNING TREE FOREST APPROACH

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ABSTRACT

The stability of top-tier banks within the LQ45 index is pivotal to Indonesia's economic resilience. However, the COVID-19 pandemic introduced unprecedented systemic shocks, potentially restructuring the financial dependencies among these institutions. This study investigates the financial network topology of LQ45 banks from 2016 to 2026 to identify structural shifts and ascertain the most influential entities across pre-pandemic, pandemic, and post-pandemic periods.

Utilizing a combination of graph theory and statistical modeling, the research analyzes Return on Asset (RoA) time-series data. Correlation matrices of the RoA dictate network edge weights, which are subsequently converted into distance matrices. To filter topological noise and extract the essential backbone of the financial network, a minimum spanning tree forest algorithm is applied. Finally, centrality measures are computed to pinpoint the structurally dominant banks within each defined timeframe.

The topological mapping is expected to reveal significant structural reorganizations driven by the global health crisis. Furthermore, centrality analyses anticipate demonstrating whether historically dominant banks maintained their systemic influence or if the pandemic catalyzed a fundamental realignment of power within the LQ45 network. Ultimately, these findings offer critical insights for policymakers to monitor systemic risk and evaluate the resilience of the banking sector under extreme macroeconomic stress.

Keywords: centrality measure; COVID-19 impact; financial network; minimum spanning tree; Return on Asset

Conference Scope: 3. Mathematics, Statistics, and Computational Modeling

Presentation Type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

SPATIO-TEMPORAL PREDICTION OF HOTSPOT OCCURRENCE LEVELS BASED ON CLIMATE FACTORS IN LAMPUNG USING MULTINOMIAL LOGISTIC REGRESSION

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ABSTRACT

Forest and land fires (Karhutla) remain a recurrent annual environmental crisis in Indonesia, notably in Lampung Province, causing significant ecological damage and socio-economic disruptions. Hotspots serve as a primary indicator for detecting potential fire occurrences across affected regions. Consequently, an effective predictive system capable of accurately classifying hotspot occurrence levels is urgently needed as a proactive disaster mitigation effort. This study aims to analyze the influence of climate factors on hotspot occurrences and develop a model to predict the level of hotspot occurrences in Lampung.

By employing a spatio-temporal approach, this study integrates K-Means clustering and correlation analyses to evaluate how climate factors—temperature, humidity, and rainfall—affect hotspot occurrence levels. Following this data exploration phase, a multinomial logistic regression model is constructed based on these integrated climate factors, setting the hotspot occurrence level as the dependent variable.

As the principal expected result, the integration of this dataset is anticipated to yield a highly accurate and reliable classification model that successfully captures the complex relationships between climatic triggers and hotspot emergencies. Ultimately, this predictive framework is expected to serve as a vital early warning tool, allowing local governments and disaster management agencies to anticipate high-risk periods, optimize resource allocation, and implement targeted preventive measures to effectively mitigate future forest and land fires in Lampung.

Keywords: hotspots; climate; K-Means clustering; multinomial logistic regression

Conference Scope: Mathematics, Statistics and Computational Modeling

INTERACTIVE LEARNING MEDIA BASED ON DIGITAL TECHNOLOGY AND MULTIMEDIA FOR EDUCATIONAL INNOVATION

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ABSTRACT

The advancement of digital technology and multimedia has encouraged various innovations in education, particularly in the development of interactive, engaging, and accessible learning media. This study aims to examine the development and implementation of interactive learning media based on digital technology and multimedia across various disciplines and educational levels. It synthesizes findings from previous studies involving the development of Android-based learning applications, Augmented Reality (AR), 2D and 3D animations, interactive simulations, WebGL technology, and Design Thinking approaches in the design and evaluation of learning media. This study employs a descriptive qualitative approach through a review and synthesis of completed research, focusing on identifying technological characteristics, development approaches, interactive features, and their applications in educational settings. The findings indicate that digital learning media have been developed and implemented in various subjects, including Hijaiyah letter recognition, natural sciences, mathematics, physics, human anatomy, cultural education, and technological skills. These technologies offer alternative approaches to presenting educational content through visualization, animation, and digital interaction, potentially enhancing student engagement and facilitating the understanding of abstract concepts. Furthermore, usability evaluation and Design Thinking approaches play important roles in developing learning media that align with user needs and expectations. This study concludes that the integration of digital technology and multimedia has significant potential to support educational innovation through the development of interactive, adaptive, and user-centered learning media.

Keywords: Interactive Learning Media, Digital Technology, Multimedia, Augmented Reality, Educational Innovation.

A MACHINE LEARNING APPROACH TO CLUSTERING SUSTAINABLE STOCKS BASED ON RISK-RETURN CHARACTERISTICS

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ABSTRACT

The increasing emphasis on sustainable investment has created a need for data-driven approaches that can support the analysis and characterization of sustainable financial assets. Investors commonly consider return and risk when evaluating stocks, while sustainability-related characteristics provide an additional dimension for investment analysis. This study proposes a machine learning-based approach to identify groups of sustainable stocks according to their risk–return characteristics.

Historical stock price data will be used to calculate relevant financial indicators, including return, volatility, and risk-adjusted performance measures. Where available, sustainability-related indicators will also be incorporated to provide additional information for characterizing the stocks. The proposed analytical framework consists of data preprocessing, exploratory analysis, financial indicator calculation, dimensionality reduction using Principal Component Analysis (PCA), and clustering using the K-Means algorithm.

The resulting clusters will be analyzed based on their distinguishing risk–return characteristics to identify meaningful patterns among sustainable stocks. Cluster validity measures will be used to assess the quality and stability of the resulting groups. Rather than directly determining investment preferences, the study aims to provide an exploratory data-driven framework for understanding heterogeneous characteristics of sustainable stocks.

The findings are expected to establish a baseline for subsequent research on sustainable portfolio construction, mathematical optimization, risk prediction, and explainable machine learning. This initial study also demonstrates how mathematical and data science methods can contribute to the development of sustainable financial analytics.

Keywords: sustainable finance; stock clustering; risk–return analysis; machine learning; PCA

APPLICATION OF NEURAL NETWORKS IN A CHATBOT FOR BOUTIQUE SERVICES

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ABSTRACT

Boutiques are a type of business in the fashion industry that face fierce competition and challenges in satisfying customer needs. Therefore, public services need to be improved, one way being through the use of technology, such as chatbots. This study aims to develop a chatbot system to help improve boutique services to customers.

The chatbot was built using a neural network approach combined with optimizers, such as Adam, Adamax, and RAdam, with the best parameter search. The neural network model was trained with a question-and-answer dataset covering various information related to boutiques. The research methods included business understanding, data understanding, data preparation, modeling, and evaluation.

Based on the results obtained, the model with the Adamax optimizer achieved better metric values than other optimizers in the evaluation stage with a confusion matrix, namely an accuracy of 89.1%, precision of 94.4%, recall of 87.3%, and an F1-score of 88%. This indicates that the Adamax optimizer is superior in generalizing new data. Although the convergence speed is much slower and the training loss obtained at the training stage is greater than other optimizers, namely 0.0332.

Keywords: chatbot; neural networks; Adam; Adamax; RAdam

Conference Scope: Artificial Intelligence, Data Science, and Digital Technology

Presentation Type: Oral Presentation

LEAKAGE-AWARE MACHINE LEARNING AND EXPLAINABLE AI FOR CROSS-ARTICLE PREDICTION OF PHARMACEUTICAL ADSORPTION CAPACITY

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ABSTRACT

Pharmaceutical residues in aquatic environments have raised increasing concern because of their continuous release and potential ecological effects. Although adsorption is widely investigated for pharmaceutical removal, variations in adsorbent properties, operating conditions, reporting formats, and experimental protocols hinder cross-study comparison and may inflate machine-learning performance through data leakage and within-article correlation. This study developed a traceable, multi-source adsorption dataset and evaluated leakage-aware machine-learning models for predicting performance across unseen articles.

Five pharmaceuticals, including diclofenac, ciprofloxacin, paracetamol/acetaminophen, ibuprofen, and tetracycline, represented diverse therapeutic classes and physicochemical characteristics. A master pool of 41 articles published between 2022 and 2026 produced 205 Level-3 experimental points from 12 articles, 21 adsorbent materials, and 46 experiments. Isotherm Strict contained 165 points for equilibrium adsorption capacity ((q_e)); Prospective Strict contained 155 points for removal fraction, excluding (C_e) and (q_e) predictors but retaining reconstructed initial concentrations in some records.

We compared seven learning algorithms and a median baseline across eight scenarios using article-grouped five-fold cross-validation and article-balanced weights. The selected Core Log support vector regression model with a radial basis function kernel achieved a root mean squared error (RMSE) of 58.32 mg/g, mean absolute error of 42.70 mg/g, R^2 of -0.421 , and article-macro RMSE of 43.12 mg/g. Despite limited absolute generalizability, article-macro RMSE decreased by 18.35% relative to the baseline, with improvements in seven of ten held-out articles. Random K-fold yielded RMSE 19.37 mg/g and R^2 0.843, indicating optimistic estimates relative to cross-article evaluation.

Out-of-fold TreeSHAP from a random-forest companion identified $\log_{10}((C_e))$, pH, contact time, adsorbent class, and dose as the leading predictive features. These findings support a proof of concept for leakage-aware validation and explainable machine learning. Additional independent articles, harmonized descriptors, and stronger validation are required before deployment.

Keywords: pharmaceutical adsorption; machine learning; data leakage; domain shift; explainable artificial intelligence

Conference Scope: Artificial Intelligence, Data Science, and Digital Technology

Presentation Type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

MACHINE LEARNING-BASED PREDICTION OF ANTIOXIDANT ACTIVITY IN SEAWEED FROM PHYTOCHEMICAL PROFILES

Yani Lukmayani, Yurika Permanasari

ABSTRACT

Seaweed is a significant source of bioactive compounds with potential applications in pharmaceutical and health research. Antioxidant activity is commonly used to evaluate the biological potential of natural product extracts; however, its relationship with phytochemical characteristics involves various interacting variables that are difficult to elucidate through conventional analytical approaches. This study proposes a data-driven approach utilizing machine learning to investigate the relationship between phytochemical profiles and antioxidant activity.

Total phenolic content and total flavonoid content—phytochemical characteristics contributing to antioxidant activity—will serve as predictor variables, while antioxidant activity, measured via appropriate assay methods, will be designated as the response variable. The research workflow encompasses exploratory data analysis, data preprocessing, correlation analysis, feature selection, and predictive modeling.

Machine learning algorithms—specifically Linear Regression and Random Forest Regression—will be evaluated and compared using the coefficient of determination (R^2), mean absolute error (MAE), and root mean square error (RMSE). This analysis aims to determine the extent to which phytochemical profiles can predict antioxidant activity and identify the variables that contribute most significantly to predictive performance.

The study is expected to provide an initial data-driven, mathematical framework for evaluating natural products and to establish a baseline model for future research involving explainable AI, bioactivity classification, and extraction optimization.

Keywords: seaweed; phytochemical profile; antioxidant activity; machine learning; data science

REGULATION OF MEASLES TRANSMISSION DYNAMICS USING ADAPTIVE SLIDING MODE CONTROL

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ABSTRACT

This study investigates a control-based approach for reducing measles transmission through coordinated vaccination and treatment interventions. A compartmental SVEIHR model is employed to represent the dynamics of susceptible, vaccinated, exposed, infectious, hospitalized, and recovered populations. Two bounded control variables are introduced to regulate vaccination and treatment activities.

An adaptive sliding mode control scheme is designed using normalized tracking surfaces associated with the vaccinated and infectious populations. The controller regulates vaccination toward a prescribed reference trajectory while driving the infectious population toward a low infection state. A dead zone adaptation mechanism is incorporated to adjust the control gains according to the magnitude of the tracking errors and to avoid unnecessary gain growth.

The epidemiological feasibility of the model is supported by positivity and boundedness analysis, while the convergence of the controlled dynamics is examined using a Lyapunov-based stability argument. Numerical simulations demonstrate that the proposed strategy substantially suppresses epidemic growth while maintaining bounded vaccination and treatment inputs. The results indicate that adaptive sliding mode control provides an effective mathematical framework for coordinating preventive and therapeutic interventions in measles transmission dynamics.

Keywords: adaptive; sliding mode control; epidemiological; Lyapunov

Conference Scope: Mathematics, Statistics, and Computational Modeling

Presentation Type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

GOVERNING KNOWLEDGE CONTRADICTIONS IN INTELLIGENT ENTERPRISE CORPORATE BRAINS

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ABSTRACT

The rapid enterprise adoption of "Intelligent Corporate Brains"—centralized, AI-driven knowledge management systems powered by Large Language Models and Knowledge Graphs—has introduced critical operational vulnerabilities. As autonomous AI agents execute workflows utilizing decentralized corporate data, they increasingly encounter semantic inconsistencies and conflicting directives uploaded by disparate organizational stakeholders, such as contradictions between legal compliance and operational strategies. Current Information Systems (IS) architectures lack rigorous, automated mechanisms to determine epistemic authority, resulting in unpredictable system behaviors, operational errors, and severe compliance risks.

Adopting a Design Science Research (DSR) approach, this study develops a novel algorithmic governance layer designed to mitigate context poisoning and reconcile cognitive dissonance within enterprise AI ecosystems. The proposed IT artifact comprises a dynamic conflict-detection ontology paired with a multi-agent authority-weighting algorithm that calculates data node validity based on organizational provenance. Grounded in Organizational Information Processing Theory (OIPT), the artifact acts as a cognitive filter, preventing the corporate brain from executing tasks based on contradictory premises.

The governance framework is instantiated via a prototype and rigorously evaluated within a simulated enterprise environment populated with conflicting compliance and strategic datasets. System performance is evaluated across metrics of semantic drift, decision-making accuracy, and policy-adherence rates against standard Retrieval-Augmented Generation (RAG) baselines.

This research contributes to IS theory by extending knowledge governance frameworks into the era of agentic AI, while providing practitioners with a concrete, scalable blueprint to ensure data veracity and structural integrity within next-generation corporate memory systems.

Keywords: Design Science Research; Intelligent Corporate Brains; Knowledge Governance; Multi-Agent Systems; Information Integrity; Organizational Information Processing Theory

Conference Scope: Artificial Intelligence and Data Science

INTEGRATED CHEMICAL PROFILING, NETWORK PHARMACOLOGY, AND MOLECULAR DOCKING REVEAL THE ANTIOXIDANT POTENTIAL OF ETHANOL EXTRACT OF *Moringa oleifera*

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ABSTRACT

Moringa oleifera is a medicinal plant containing diverse bioactive compounds with potential antioxidant properties. This study aimed to characterize the chemical constituents of the 70% ethanol extract of *Moringa oleifera* and investigate their potential antioxidant mechanisms through an integrated pharmacokinetic, toxicity, network pharmacology, and molecular docking approach.

Chemical profiling identified 19 putative compounds, including chlorogenic acid, rutin, isoquercetin, nictoflorin, and other structurally diverse metabolites. Pharmacokinetic and drug-likeness properties were evaluated using SwissADME, followed by toxicity prediction to prioritize compounds with suitable profiles for further computational analysis. Network pharmacology analysis identified 324 overlapping proteins between the predicted targets of *Moringa oleifera* compounds and antioxidant-related targets, which were subsequently evaluated through protein–protein interaction and functional enrichment analyses.

Hub-target analysis using Degree, Edge Percolated Component, and Closeness algorithms identified STAT3, HSP90AA1, ESR1, HDAC1, EGFR, and PTGS2 as potential key molecular targets. Molecular docking revealed that Compound 17 exhibited favorable binding toward ESR1 (−10.37 kcal/mol; estimated Ki 25.04 nM) and EGFR (−9.78 kcal/mol; estimated Ki 67.79 nM), while Compound 19 showed favorable interactions with EGFR (−9.55 kcal/mol; estimated Ki 99.94 nM) and PTGS2 (−9.71 kcal/mol; estimated Ki 76.29 nM).

These findings indicate that the potential antioxidant activity of *Moringa oleifera* may involve a multi-compound and multi-target mechanism mediated through several proteins associated with oxidative stress and cellular signaling. This integrated computational investigation provides molecular-level evidence supporting the antioxidant potential of the 70% ethanol extract of *Moringa oleifera* and highlights promising compounds and molecular targets for subsequent experimental validation.

Keywords: *Moringa oleifera*; Antioxidant activity; Chemical profiling; Network pharmacology; Molecular docking.

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: Poster Presentation

CONTEXT-AWARE SPATIAL INTERACTION MODEL IN AUGMENTED REALITY E-MODULES FOR ETHNO-STEAM

Puspa Citra¹

ABSTRACT

Background: Conveying multi-layered, abstract mathematical structures and engineering concepts within cultural heritage assets (Ethno-STEAM) using standard 2D textbook projections severely limits student spatial cognition. Conventional Augmented Reality (AR) tools overlay 3D meshes as monolithic blocks, lacking responsive, context-aware interaction states.

Objective: This study aims to formulate, implement, and evaluate the Context-Aware Spatial Interaction Model (CASIM) to provide dynamic, stable, and highly interactive structural visualizations within mobile-based educational e-modules.

Methods: We formulated a 3D raycasting plane-intersection algorithm combined with a 5-state Finite-State Machine (FSM) using Unity 3D and the Vuforia SDK. System evaluation comprised technical performance benchmarking across three distinct mobile processor profiles, an HCI usability assessment using the System Usability Scale (SUS; N = 30), and a quasi-experimental pedagogical trial (N = 60) measuring learning gains against static 2D media.

Results: Technical assessments demonstrated a tracking latency of 1.15 s under standard classroom lighting of 250 lux and stable rendering (≤ 58.5 FPS) for optimized assets (1.48×10^4 polygons). The SUS evaluation yielded an outstanding usability score of 88.5 (Grade A, Cronbach's $\alpha = 0.892$). Crucially, the experimental pedagogical group achieved a highly significant learning increase ($p < 0.001$), with a normalized Hake's gain of 0.66, compared to only 0.31 for the control group.

Conclusion: CASIM is a robust, lightweight, and highly effective framework for interactive engineering visualization on low-to-mid-range mobile hardware. Future work will investigate browser-based WebAR to eliminate the need for native application installation.

Keywords: Augmented Reality; Context-Aware Interaction; Human-Computer Interaction; Ethno-STEAM; Finite-State Machine.

IN VITRO α -AMYLASE INHIBITORY ACTIVITY OF ULTRASONIC-ASSISTED EXTRACT AND FRACTIONS OF ROSELLE FLOWERS (*Hibiscus sabdariffa* L.)

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ABSTRACT

The α -amylase enzyme plays a key role in starch hydrolysis and postprandial blood glucose elevation, making its inhibition a relevant strategy for managing type 2 diabetes mellitus. Roselle flowers (*Hibiscus sabdariffa* L.) are rich in phenolics, flavonoids, and anthocyanins with potential α -amylase inhibitory activity. This study aimed to determine the α -amylase inhibitory activity of 70% and 96% ethanol extracts of roselle flowers obtained via Ultrasonic-Assisted Extraction (UAE) and to further evaluate the most active extract through liquid–liquid fractionation using n-hexane, ethyl acetate, and water.

Both extracts were characterized phytochemically and assayed for α -amylase inhibition using ultraviolet-visible (UV–Vis) spectrophotometry at 570 nm, while total phenolic content was determined for the extract and its fractions. The 70% ethanol extract exhibited stronger α -amylase inhibition than the 96% ethanol extract, with half-maximal inhibitory concentration (IC_{50}) values of 59.16 ± 0.39 , 59.06 ± 0.57 , and 59.06 ± 0.23 μ g/mL for replicates 1a, 1b, and 1c, respectively. Fractionation of the 70% ethanol extract revealed that the water fraction was the most potent, with IC_{50} values of 23.33 ± 0.31 , 23.43 ± 0.73 , and 23.52 ± 0.21 μ g/mL.

Phytochemical screening confirmed the presence of phenolics, flavonoids, glycosides, and anthocyanins in both the extract and the water fraction. The 70% ethanol extract showed the highest total phenolic content (54.30–54.56 mg gallic acid equivalents [GAE]/g) compared with the water fraction (39.49–39.69 mg GAE/g). These findings indicate that the 70% ethanol extract and its water fraction possess promising antidiabetic potential through α -amylase enzyme inhibition, supporting further investigation into the development of roselle flowers as a natural antidiabetic agent.

Keywords: Roselle flower; α -amylase enzyme; Ultrasonic-Assisted Extraction; phenolic content.

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

FORMULATION AND EVALUATION OF LIP BALM CONTAINING KARAMUNTING FLOWER EXTRACT (*Melastoma malabathricum* L.)

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ABSTRACT

Lip balm is a moisturizing preparation applied to the lips to protect them, maintain moisture, and keep them healthy. Karamunting flowers (*Melastoma malabathricum* L.) have been reported to exhibit antioxidant activity, with an antioxidant value of 17.86 $\mu\text{g/mL}$. This study aimed to formulate lip balm preparations containing karamunting flower extract and evaluate their physical properties.

Karamunting flowers were macerated using 96% ethanol as the solvent, and the resulting extract was concentrated using a rotary evaporator. Secondary metabolite screening was performed on the extract. Lip balm preparations containing karamunting flower extract at concentrations of 8%, 10%, and 12% were then formulated. The physical properties evaluated included organoleptic characteristics, homogeneity, spreadability, melting point, and pH.

The physical evaluation results showed that the lip balm preparations had a semisolid consistency, with colors ranging from light orange-brown to dark orange-brown, a characteristic oleum cacao aroma, and a soft texture. All formulations were homogeneous and demonstrated good spreadability. The preparations had a melting point of 50°C and pH values ranging from 4.0 to 4.2.

In conclusion, lip balm formulations containing karamunting flower extract demonstrated favorable physical properties and may have potential for further development as herbal lip care products.

Keywords: Lip balm; Karamunting; Natural antioxidant.

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation.

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

INOCULATION TEST OF REPRESENTATIVE DENITRIFYING BACTERIA ISOLATED FROM SELECTED PADDY RICE AREAS IN NUEVA ECIJA AND PANGASINAN, PHILIPPINES, ON RICE (*Oryza sativa* L. NSIC Rc222)

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ABSTRACT

This study evaluated the effects of representative bacterial consortia isolated from selected paddy rice fields in Nueva Ecija and Pangasinan, Philippines, on rice (*Oryza sativa* L. NSIC Rc222) under continuous flooding and alternate wetting and drying (AWD) conditions. A randomized complete block design with two factors, water management and bacterial inoculation, was established in a mesocosm experiment to determine microbial establishment, soil nitrogen dynamics, plant nitrogen uptake, growth, and yield.

The introduced bacterial consortia successfully colonized the rhizosphere, although their persistence varied depending on the water regime and isolate origin. Continuous flooding favored the highest microbial population and plant nitrogen uptake, particularly in the Guimba consortium, suggesting enhanced biological nitrogen fixation and improved nitrogen availability. In contrast, AWD promoted alternating aerobic and anaerobic soil conditions that stimulated nitrification during drying periods and denitrification following re-flooding, increasing the potential for nitrogen losses through gaseous emissions.

Despite minimal changes in residual soil total nitrogen, inoculated treatments improved plant nitrogen uptake, indicating more efficient nitrogen transformation rather than increased nitrogen accumulation in the soil. Integrating microbial inoculation with appropriate water management enhanced nitrogen-use efficiency by regulating the balance among biological nitrogen fixation, nitrification, and denitrification. These improvements resulted in increased plant growth, higher biomass production, and greater grain yield compared with uninoculated controls.

The findings demonstrate that locally isolated bacterial inoculants have potential as biofertilizers for sustainable rice production by improving microbial nitrogen cycling, reducing nitrogen losses, and enhancing crop productivity.

Keywords: Denitrification; nitrification; nitrogen-use efficiency; paddy rice soil; water management.

Conference scope: Food Science, Agriculture, and Natural Resources.

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

ANTICARIES ACTIVITY OF *Wedelia trilobata* ETHANOLIC EXTRACT AGAINST *Streptococcus mutans*

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ABSTRACT

Dental caries remains a significant global public health concern, primarily driven by the acidogenic virulence and biofilm-forming capabilities of *Streptococcus mutans*. The increasing prevalence of antibiotic resistance has raised concerns about the efficacy of conventional chemical antimicrobials, prompting the search for plant-derived antibacterial alternatives for potential oral use. Therefore, this study aimed to evaluate the antibacterial activity of the ethanolic extract of *Wedelia trilobata* leaves against *Streptococcus mutans*.

The antibacterial activity was assessed using the Kirby–Bauer disk diffusion method. The experimental groups were treated with *Wedelia trilobata* ethanolic extract at concentrations of 1.25%, 2.5%, 5%, and 10%, with chloramphenicol (30 µg) as the positive control and an untreated negative control group. The findings revealed that the ethanolic extract of *Wedelia trilobata* inhibited the growth of *Streptococcus mutans* in a dose-dependent manner. Among the tested extract concentrations, the 10% concentration demonstrated the strongest antibacterial activity, producing an average inhibition zone diameter of 18.63 mm, compared with 27.90 mm for the positive control. The negative control showed no inhibition zone.

These findings suggest that *Wedelia trilobata* ethanolic leaf extract has potential as a plant-derived antibacterial agent against *Streptococcus mutans* and warrants further investigation for its possible application in oral health care.

Keywords: Anticaries; Kirby–Bauer; *Streptococcus mutans*; *Wedelia trilobata*; zone of inhibition.

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation.

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

ISOLATION OF α -CELLULOSE AND CHARACTERIZATION OF MICROCRYSTALLINE CELLULOSE (MCC) FROM KENIKIR LEAF RESIDUE (*Cosmos caudatus* Kunth) AS A PHARMACEUTICAL EXCIPIENT

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ABSTRACT

The demand for pharmaceutical excipients such as microcrystalline cellulose (MCC) in Indonesia remains heavily reliant on imported products. Utilizing medicinal plant biomass waste, such as the extraction residue of kenikir leaves (*Cosmos caudatus* Kunth), represents a strategic alternative to support sustainability and national self-sufficiency in pharmaceutical raw materials. This study aimed to isolate α -cellulose from kenikir leaf residue and produce and characterize the resulting MCC.

α -Cellulose was isolated through a modified Kraft delignification process using 10% NaOH and 3.5% NaOCl. MCC was subsequently synthesized through enzymatic hydrolysis using cellulase. The results showed an α -cellulose yield of 6.423% (38.54 g) from 600 g of dried simplicia and an MCC yield of 83.09% (29.08 g) from the α -cellulose. Characterization of the MCC derived from kenikir leaf residue revealed a white, odorless, and tasteless crystalline powder, with a melting point of 270°C, a pH of 6, a moisture content of 3.27%, and an ash content of 1.15%. Qualitative identification using iodinated zinc chloride yielded a positive result, indicated by a violet-blue coloration. The FTIR spectral profile confirmed the presence of characteristic cellulose functional groups and showed similarity to the commercial standard Avicel® PH 101.

Based on organoleptic, solubility, pH, and functional group analyses, the MCC derived from kenikir leaf residue shows potential as an alternative pharmaceutical excipient. Further evaluation against applicable pharmacopeial specifications is necessary to establish its suitability for pharmaceutical applications.

Keywords: *Cosmos caudatus* Kunth; α -cellulose; microcrystalline cellulose (MCC); delignification; hydrolysis; pharmaceutical excipients.

FORTIFICATION OF ANCHOVY FLOUR (*Stolephorus* sp.) AND MORINGA LEAF FLOUR (*Moringa oleifera*) IN THE PRODUCTION OF HIGH-PROTEIN AND IRON-RICH RICE CRACKERS

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ABSTRACT

Rice crackers are rice-based snacks with a crispy texture but generally have relatively low protein and iron contents. Fortification with anchovy flour (*Stolephorus* sp.) and moringa leaf flour (*Moringa oleifera*) was carried out to improve the nutritional value of the product. This study aimed to characterize anchovy flour and moringa leaf flour, determine the selected formulation of fortified rice crackers, and characterize the selected formulation in comparison with the control formulation.

The study began with the characterization of both flours through proximate analysis, iron determination using atomic absorption spectrophotometry (AAS), amino acid analysis using high-performance liquid chromatography (HPLC), and phytochemical screening. This was followed by the preparation of one control formulation and five fortified formulations, organoleptic testing to determine the selected formulation, and proximate, iron, and amino acid analyses of the selected formulation compared with the control.

Anchovy flour contained 5.12% moisture, 9.74% ash, 71.21% protein, 13.27% fat, 0.55% carbohydrate, and 12.64 mg/100 g iron. Moringa leaf flour contained 9.65% moisture, 8.42% ash, 17.60% protein, 12.50% fat, 51.76% carbohydrate, and 22.54 mg/100 g iron. Phytochemical screening of moringa leaf flour identified alkaloids, flavonoids, saponins, tannins, and steroids/triterpenoids.

Formula 2, containing 15 g of anchovy flour and 5 g of moringa leaf flour, was selected based on the highest hedonic score. Compared with the control, the selected formulation showed decreases in moisture (77.69%) and carbohydrate (27.88%), alongside increases in ash (76.13%), fat (44.08%), protein (103.57%), iron (664.79%), and total amino acids (96.88%).

These findings demonstrate that fortification with anchovy flour and moringa leaf flour can improve the nutritional profile of rice crackers, particularly their protein, iron, and amino acid contents, highlighting the potential of this formulation as a more nutrient-dense snack product.

Keywords: Rice crackers; anchovy flour; moringa leaf flour; protein; iron.

LC-MS/MS-BASED METABOLOMIC FINGERPRINTING COUPLED WITH CHEMOMETRICS FOR AUTHENTICATION OF *Strobilanthes crispa* AGAINST *Piper aduncum* ADULTERATION

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ABSTRACT

Authentication of medicinal plants is essential to ensure the quality, safety, and consistency of herbal products, particularly when morphologically similar species may be used as adulterants. *Strobilanthes crispa* (L.) Blume, commonly known as Keji Beling, is widely utilized in traditional medicine but may be susceptible to adulteration with *Piper aduncum* L. This study aimed to develop an analytical approach combining liquid chromatography–tandem mass spectrometry (LC-MS/MS)-based metabolomic fingerprinting and chemometric analysis to differentiate authentic *S. crispa* from *P. aduncum* and their mixtures.

Leaf samples of both species were collected from West, Central, and East Java, Indonesia. Ethanolic extracts were analyzed using LC-MS/MS with a C18 column and a gradient mobile phase consisting of 0.1% formic acid in water and acetonitrile. Chromatographic conditions were optimized based on peak resolution, separation efficiency, and analytical performance. Adulterated samples containing 5%, 25%, and 50% *P. aduncum* were evaluated using principal component analysis (PCA).

The optimized chromatographic method achieved a peak resolution of 1.8264 and identified 397 putative metabolites, of which 23 were supported by MS/MS fragmentation data. PCA revealed distinct clustering patterns among authentic *S. crispa*, *P. aduncum*, and their adulterated mixtures, with the first two principal components explaining approximately 43% of the total variance.

These findings demonstrate the potential of LC-MS/MS-based metabolomic fingerprinting integrated with chemometrics as a promising approach for detecting herbal adulteration and supporting quality control and authentication of *S. crispa* raw materials.

Keywords: *Strobilanthes crispa*; herbal authentication; LC-MS/MS; metabolomic fingerprinting; chemometrics; adulteration.

Conference: The 2nd International Conference on Technology and Natural Sciences (ICoTenS) 2026

Theme: Harmony of Science, Technology, and Culture for Sustainability

Venue: IPB Convention Center, Bogor, Indonesia

Conference scope: Natural Sciences and Biodiversity

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

SYNTHESIS AND CHARACTERIZATION OF BIO-MOFs FROM Cu METAL WITH L-ASPARTIC ACID LIGAND AND THEIR POTENTIAL AS PHOTOCATALYSTS FOR HYDROGEN GAS PRODUCTION

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ABSTRACT

Dependence on fossil fuels contributes to energy crises and global environmental degradation, making the development of new and renewable energy (NRE) sources, such as hydrogen gas (H₂) produced through photocatalytic technology, increasingly important. Biologically derived metal-organic frameworks (Bio-MOFs) based on copper (Cu) and the natural ligand L-aspartic acid hold potential as photocatalysts due to their porous structures, high surface areas, and potentially environmentally friendly properties. This study aimed to synthesize Cu-aspartate Bio-MOFs at temperatures of 100°C and 120°C using a solvothermal method for 8 hours and investigate the effects of temperature on their structural characteristics, optical properties, and electrochemical activity.

Sample characterization was performed using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and UV-visible diffuse reflectance spectroscopy (UV-Vis DRS). Proton (H⁺) reduction activity was subsequently evaluated using cyclic voltammetry (CV) in 1 M H₂SO₄ solution with a three-electrode system. The results showed that solvothermal synthesis successfully produced blue crystalline solids characteristic of copper complexes. The FTIR spectra confirmed coordination between Cu²⁺ cations and the ligand's carboxylate groups, as indicated by characteristic Cu-O absorption bands at 567–572 cm⁻¹.

XRD analysis revealed that increasing the reaction temperature enhanced sample crystallinity. The sample synthesized at 120°C exhibited a larger average crystallite size (109.3 nm) and higher crystallinity (64.25%) than the sample synthesized at 100°C, which had an average crystallite size of 77.9 nm and crystallinity of 61.39%. UV-Vis DRS analysis classified both samples as ultraviolet-active semiconductors, with band gap energies of 3.44 eV at 100°C and 3.45 eV at 120°C. CV measurements demonstrated proton reduction activity, indicated by an irreversible, continuous cathodic current profile (catalytic wave). The superior performance of the 100°C sample was attributed to its more open pore framework structure, which may facilitate proton penetration toward active Cu sites.

In conclusion, the Cu-aspartate Bio-MOF synthesized at 100°C exhibited the most favorable characteristics and the greatest potential as a candidate material for hydrogen production. Further investigation is needed to confirm its photocatalytic performance under suitable light-irradiation conditions.

Keywords: L-aspartic acid; Bio-MOFs; copper; hydrogen production; photocatalysis.

Conference: The 2nd International Conference on Technology and Natural Sciences (ICoTenS) 2026

Theme: Harmony of Science, Technology, and Culture for Sustainability

Venue: IPB Convention Center, Bogor, Indonesia

Conference scope: Sustainable Materials

Presentation type: Oral Presentation ☒ | Poster Presentation ☐ | Student Presentation ☐

NETWORK PHARMACOLOGY, MOLECULAR DOCKING, AND MOLECULAR DYNAMICS APPROACHES TO EVALUATE THE POTENTIAL OF CASSIA ALATA IN DIABETIC WOUND HEALING

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ABSTRACT

Diabetic wound healing involves complex regulation of chronic inflammation, in which persistent inflammatory signals often delay tissue regeneration. Cassia alata is known to promote wound recovery; however, its multi-target molecular mechanisms remain unclear. This study evaluated the potential of Cassia alata phytoconstituents in diabetic wound healing using network pharmacology, molecular docking, and molecular dynamics approaches. Bioactive compounds were screened using KNApSAcK, followed by target mapping using STRING and network visualization and analysis using Cytoscape. Molecular docking was performed using AutoDockTools, while 100-ns molecular dynamics simulations were conducted using YASARA Dynamics to assess the stability of protein–ligand complexes.

Protein–protein interaction analysis revealed a significant interaction network (PPI enrichment $p < 1.0 \times 10^{-16}$), with cyclooxygenase-2 (COX-2) identified as one of the hub proteins. Molecular docking showed that chrysoeriol and quercetin exhibited the highest binding affinities toward COX-2, with binding energies of -8.58 kcal/mol and -8.31 kcal/mol, respectively. Molecular dynamics simulations further supported the conformational stability of these complexes over 100 ns, with backbone root-mean-square deviation (RMSD) values ranging from 1.2 to 2.8 Å. Residue flexibility was generally low, with root-mean-square fluctuation (RMSF) values remaining below 2.0 Å, while minor peaks of up to 4.0 Å were confined to flexible loop regions. These findings suggest that *C. alata* phytoconstituents may help attenuate chronic inflammation in diabetic wounds through modulation of COX-2. The results highlight the potential therapeutic relevance of these compounds and provide a basis for further experimental validation of their roles in diabetic wound healing.

Keywords: Cassia alata; Diabetic wound healing; Molecular docking; Molecular dynamics; Network pharmacology

Conference Scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation Type: Oral Presentation

INSTRUMENTAL LEAF COLOR AND ITS RELATIONSHIP WITH PIGMENT AND SECONDARY METABOLITE CONTENT IN GRAPTOPHYLLUM PICTUM

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ABSTRACT

Graptophyllum pictum is an ornamental plant known for its bioactive potential. Most studies on its bioactivity have focused on the *Lurido-sanguineum* variety, which exhibits different leaf color phenotypes within a single plant. This study aimed to identify trends in CIELAB color parameters that could serve as phenotypic indicators of anthocyanin, chlorophyll, and carotenoid contents, as well as flavonoid and phenolic compounds. Leaf samples were classified into two groups based on their a^* values. Each group was further divided into three subgroups to compare sample color distribution in relation to CIELAB parameters and to evaluate associations with anthocyanin, chlorophyll, and carotenoid levels, as well as flavonoid and phenolic contents. Fresh leaf samples were macerated using 70% ethanol acidified to pH 1.16. The results revealed a clear distinction in color distribution between the U and H groups. The CIELAB parameters also showed a tendency toward strong and significant associations with the relative anthocyanin-to-chlorophyll (Anth/Chl) composition, suggesting that these parameters may help characterize leaf color variation associated with differences in pigment composition.

Keywords: CIELAB parameters; Fresh leaves; Leaf color; Pigment metabolites; Phenotype

PHYSICOCHEMICAL CHARACTERIZATION AND ANTIOXIDANT ACTIVITY OF BARAM, A TRADITIONAL DAYAK NGAJU FERMENTED BEVERAGE

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ABSTRACT

Baram is a traditional fermented beverage made from glutinous rice using a yeast starter characteristic of the Dayak Ngaju community. It has the potential to contain bioactive compounds, although its properties have not been extensively investigated scientifically. This study aimed to characterize the physicochemical properties and bioactive components of Baram and evaluate its antioxidant potential. The analyses included pH and acidity measurements, volatile compound analysis using gas chromatography–mass spectrometry (GC–MS), carbohydrate testing, glucose analysis using high-performance liquid chromatography (HPLC), functional group identification using Fourier-transform infrared spectroscopy (FTIR), and antioxidant activity testing. Statistical analyses were performed using SPSS, with One-Way Analysis of Variance (ANOVA) and Kruskal–Wallis tests.

The results showed that pH decreased from 4.61 ± 0 to 2.37 ± 0.030 , while acidity increased from $0.72\% \pm 0$ to $3.42\% \pm 0$. Phenolic compounds were identified as the main components, accompanied by a decrease in glucose levels from 2,487.67 to 1,083.33. FTIR analysis confirmed the presence of functional groups associated with phenolic compounds. Antioxidant activity increased significantly, with the IC_{50} value improving from 5,452 ppm, indicating very weak activity, to 43.48 ppm, indicating very strong activity ($p < 0.05$).

These findings suggest that Baram has potential as a traditional fermented beverage containing bioactive compounds and exhibiting antioxidant activity. This study provides a scientific basis for further investigation of Baram as a fermented product rooted in the local wisdom of the Dayak Ngaju community.

Keywords: Baram; Physicochemical characterization; Antioxidant activity; Fermented beverage; Dayak Ngaju

Conference Scope: Biology, Biodiversity, Biotechnology, and Conservation

Presentation Type: Oral Presentation

GREEN SYNTHESIS OF NICKEL OXIDE NANOPARTICLES USING PINEAPPLE LEAF WASTE FILTRATE FOR LITHIUM-ION BATTERY ANODE APPLICATIONS

Dvito Alkindi¹

ABSTRACT

This study investigated the synthesis of nickel oxide (NiO) using pineapple leaf waste filtrate from Lampung, Indonesia (*Ananas comosus*), for evaluation as a candidate anode material for lithium-ion batteries (LIBs). The synthesis was conducted using $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ at calcination temperatures of 350, 450, 550, and 650 °C, with filtrate volumes of 10, 15, and 20 mL. Phytochemical screening confirmed the presence of saponins, flavonoids, tannins and phenolic compounds (polyphenols), and alkaloids in the filtrate, while UV–Vis analysis indicated an energy gap of approximately 4 eV. Characterization using X-ray diffraction (XRD) and field-emission scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (FESEM-EDS) revealed that the addition of pineapple leaf filtrate influenced the crystal structure and morphology of NiO. Compared with the conventionally synthesized sample, the filtrate-assisted samples exhibited relatively smaller, more uniformly distributed particles with reduced agglomeration.

Among the synthesized samples, GS10-650 exhibited relatively good crystallinity and an average particle size of approximately 27.71 nm. It also demonstrated a discharge capacity of approximately 1,042 mAh g⁻¹ and a capacity retention of about 97.6% during the initial cycling test. These findings indicate that pineapple leaf waste filtrate has potential as a supporting agent in a more environmentally friendly NiO synthesis process and as an alternative to synthetic particle-control agents. This approach also offers a potential pathway for valorizing local biomass in the development of candidate anode materials for lithium-ion batteries.

Keywords: NiO; Green synthesis; Pineapple leaf filtrate; Nanoparticles; Lithium-ion battery anode

ISONICOTINIC ACID-MODULATED IRON(III)-PERYLENE METAL-ORGANIC FRAMEWORK FOR ENHANCED METHYLENE BLUE PHOTODEGRADATION: SYNTHESIS, RSM-CCD OPTIMIZATION, AND KINETIC STUDY

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ABSTRACT

A novel iron(III)-based metal–organic framework (Fe-PTC-HIna) was synthesized via a solvothermal method using perylene-3,4,9,10-tetracarboxylate (PTC) as the organic linker and isonicotinic acid (HIna) as a modulator. Comprehensive characterization using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), ultraviolet–visible diffuse reflectance spectroscopy (UV–Vis DRS), scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM–EDS), Brunauer–Emmett–Teller (BET) surface area analysis, and thermogravimetric analysis coupled with differential scanning calorimetry (TGA–DSC) revealed that HIna incorporation enhanced crystallinity to 58%, reduced crystallite size to 19.08 nm, and increased the specific surface area and pore volume to 26.89 m²/g and 0.1975 cm³/g, respectively, compared with pristine Fe-PTC. The optical band gap increased slightly from 1.94 to 1.99 eV, while the valence and conduction band positions became more favorable for photocatalytic reactions in the presence of H₂O₂.

The photocatalytic degradation of methylene blue was optimized using response surface methodology with a central composite design (RSM–CCD). The effects of photocatalyst dosage, H₂O₂ concentration, and irradiation time were evaluated through 20 experimental runs. The highest experimentally observed degradation efficiency was 95.68%, whereas the quadratic model predicted an optimum efficiency of 97.23% at a photocatalyst dosage of 2.0 mg, an H₂O₂ concentration of 0.2091 M, and an irradiation time of 150 min. Kinetic analysis showed that methylene blue photodegradation followed a pseudo-first-order model, with an apparent rate constant of 0.0198 min^{−1} and a coefficient of determination (R²) of 0.9835, indicating a better fit than the pseudo-second-order model (R² = 0.9384).

The enhanced photocatalytic performance was attributed to improved structural properties, increased accessibility of active sites, and favorable electronic characteristics. These findings highlight the potential of Fe-PTC-HIna as a visible-light-responsive photocatalyst and demonstrate the utility of RSM–CCD optimization for improving dye wastewater treatment processes.

Keywords: Iron(III)-based metal–organic framework; Isonicotinic acid; Methylene blue; Photocatalytic degradation; Response surface methodology

MESOPOROUS BIOCHAR COMPOSITE DERIVED FROM OIL PALM EMPTY FRUIT BUNCHES (EFB) AND MODIFIED WITH NATURAL ZEOLITE: A PRELIMINARY STUDY OF ITS POTENTIAL AS A LIVESTOCK FEED ADDITIVE FOR AMMONIA EMISSION MITIGATION

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ABSTRACT

Ammonia emissions from livestock systems adversely affect air quality, animal health, and nutrient-use efficiency. Biochar offers a high surface area and active functional groups, while zeolite exhibits a high cation-exchange capacity that facilitates ammonium ion binding. This study evaluated a composite of oil palm empty fruit bunches (EFB)-derived biochar and natural zeolite as a candidate feed additive for ammonia mitigation. Biochar was produced by pyrolysis at 500, 600, and 700 °C and subsequently combined with natural zeolite at mass ratios of 1:1, 1:2, and 2:1. Fourier-transform infrared spectroscopy (FTIR) identified O–H/N–H, aromatic C=C, and Si–O–Si/Si–O–Al bands, confirming the presence of characteristic functional groups associated with biochar and zeolite in the composite.

Among the tested formulations, the biochar/zeolite nanocomposite (NC B/Z) prepared at 700 °C with a 1:1 mass ratio exhibited the best performance, achieving a residual ammonia concentration of 0.18 mg/L, an adsorption capacity of 19.64 mg/g, and a removal efficiency of 98.20%. These results outperformed those of NC B/Z prepared at 700 °C with a 2:1 ratio, which yielded a residual ammonia concentration of 2.08 mg/L, an adsorption capacity of 15.84 mg/g, and a removal efficiency of 79.20%, as well as NC B/Z prepared at 500 °C with a 1:1 ratio, which yielded corresponding values of 2.18 mg/L, 15.63 mg/g, and 78.16%. The improved adsorption performance at 700 °C was associated with a higher surface area and a more homogeneous pore morphology.

Overall, the biochar/zeolite composite prepared at 700 °C with a 1:1 mass ratio demonstrates potential as a sustainable candidate feed additive for mitigating ammonia emissions in livestock systems under the tested laboratory conditions. Further studies are needed to validate its safety, efficacy, and performance in practical livestock applications.

Keywords: Biochar; Natural zeolite; Ammonia adsorption; Empty fruit bunches; Feed additive; Ammonia mitigation

Conference Scope: Green Chemistry, Sustainable Materials, and Environmental Analysis

Presentation Type: Oral Presentation; Student Presentation

PCA-BASED CLUSTERING OF HEAVY METAL POLLUTION IN COASTAL SEAWATER FOR RISK MAPPING: A CASE STUDY OF THE NORTH COAST OF EAST JAVA

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ABSTRACT

Heavy metal contamination is a major threat to coastal seawater quality. Laboratory assessments typically measure parameters such as pH, temperature, and the concentrations of lead (Pb), copper (Cu), iron (Fe), cadmium (Cd), and chromium (Cr). However, these results are often analyzed without incorporating sampling-location information, making it difficult to identify spatial patterns of pollution. This study applied principal component analysis (PCA) and clustering to eight seawater samples collected from the northern coast of East Java, Indonesia. Seven parameters were standardized and reduced to two principal components, which together explained 86.8% of the total variance. The samples were subsequently classified into three clusters. Comparison with field sampling records revealed that each cluster corresponded to one sampling area: Pasuruan City, Pasuruan Regency, or Probolinggo Regency.

These findings suggest that PCA-based clustering can identify spatial patterns in heavy metal pollution using laboratory measurement data and subsequently associate the resulting clusters with known sampling areas. This approach provides a data-driven method to support preliminary pollution risk mapping and coastal environmental management. Further validation using larger datasets and independent sampling locations is needed to assess its generalizability and reliability for broader environmental monitoring applications.

Keywords: Heavy metals; Seawater quality; Principal component analysis; Unsupervised machine learning; Pollution risk mapping

Conference scope: Artificial Intelligent and Data Science

FORMULATION AND PHYSICOCHEMICAL CHARACTERIZATION OF SALVADORA PERSICA L. STEM EXTRACT NANOSUSPENSIONS USING TWEEN 80

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ABSTRACT

Salvadora persica L. (miswak) stem extracts possess antibacterial, antioxidant, and anti-inflammatory activities; however, their potential applications are limited by poor solubility, physical instability, and relatively large particle sizes. This study aimed to characterize the phytochemical profile of an ethanolic *S. persica* stem extract and evaluate the effects of Tween 80 concentration on the physicochemical properties and short-term stability of its nanosuspensions. The stems were macerated using 70% ethanol, yielding 7.5% extract. Nanosuspensions were prepared using the antisolvent precipitation method at extract-to-stabilizer ratios of 1:0 (F0), 1:1 (F1), 1:2 (F2), and 1:4 (F3). Phytochemical screening indicated the presence of alkaloids, flavonoids, saponins, and terpenoids. Liquid chromatography–tandem mass spectrometry (LC-MS/MS), using positive-mode electrospray ionization and a quadrupole time-of-flight analyzer, detected 34 peaks, of which four compounds were tentatively annotated as harmine, coclaurine, andrographolide, and 1,3-dibenzylurea.

The unstabilized formulation (F0) exhibited a particle size of 362.6 ± 13.15 nm, whereas the Tween 80-containing formulations showed reported particle sizes ranging from 12.6 to 16 nm. Among the formulations, F3 exhibited the lowest polydispersity index (0.5307 ± 0.01), the highest absolute zeta potential (-24.8 ± 0.1 mV), and the highest transmittance ($95.29 \pm 0.16\%$). During 28 days of storage at 4 °C and room temperature, F3 showed no observable organoleptic changes, whereas F0 underwent precipitation during the third week of storage at room temperature. These findings indicate that the extract-to-stabilizer ratio influences the dispersion characteristics and short-term physical stability of *S. persica* stem extract nanosuspensions. Formulation F3 represents a promising candidate for further investigation, including confirmatory compound identification and bioactivity evaluation.

Keywords: *Salvadora persica*; Miswak; Nanosuspension; Tween 80; LC-MS/MS; Physical stability

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Conference Scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation Type: Oral Presentation

TIRUCALLANES FROM DYSOXYLUM ALLIACEUM STEM BARKS IN HUMAN CANCER AND NORMAL CELL LINES

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ABSTRACT

[Alliaceumolide A (1), a new macrolide together with known ivorenolide B (2) were isolated from *Dysoxylum alliaceum* Blume (Blume) ex A.Juss. These compounds were classified as 17-membered macrolide, which is a rare structure for plant-derived natural products. The structures were elucidated by extensive spectroscopic analyses, and the absolute configuration of 1 was determined by electronic circular dichroism (ECD) using TDDFT method. Furthermore, compounds 1 and 2 were tested for cytotoxic activity against two cancer MCF-7 and HeLa cell lines.]

Keywords: *Dysoxylum alliaceum*, Meliaceae, alliaceumolide A, macrolide, cytotoxic

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

THE EFFECT OF SOLVENT RATIOS ON THE ANTIOXIDANT ACTIVITY AND IN VITRO LIPASE INHIBITORY ACTIVITY OF MATCHA TEA LEAF EXTRACT (CAMELLIA SINENSIS L.)

TRI DEVI SUKANTI. 066122063. 2026. The Effect of Solvent Ratios on the Antioxidant Activity and In Vitro Lipase Inhibitory Activity of Matcha Tea Leaf Extract (*Camellia sinensis* L.). Supervised by: Lilik Sulastris and Marybet Tri Retno Handayani.

ABSTRACT

Matcha is a type of green tea derived from the *Camellia sinensis* L. plant that is consumed in the form of a fine powder; as such, it is rich in secondary metabolites such as polyphenols and catechins, which act as antioxidants and have the potential to inhibit the lipase enzyme for the treatment of obesity. This study aims to determine the total phenolic content, antioxidant activity, and in vitro lipase inhibitory activity of matcha tea leaf extract obtained using the Ultrasound-Assisted Extraction (UAE) method, using the following solvent combinations: 96% ethanol + acid, 70% ethanol + acid, 50% ethanol + acid, 70% ethanol, 50% ethanol, and water.

The UAE extraction method was performed at a frequency of 40 kHz for 20 minutes at a temperature of 40°C. Total phenolic content was analyzed using the Folin Ciocalteu method, antioxidant activity was measured using the DPPH method with a UV-Vis spectrophotometer; and lipase inhibition was assessed using acid-base titration.

The results showed that the matcha extract had the highest total phenolic content in the 50% ethanol + acid solvent, at 86.78 mg GAE/g. All extracts exhibited very strong antioxidant activity, with the best result obtained using 70% ethanol, yielding an IC₅₀ value of 2.52 ppm. Furthermore, the strongest lipase inhibitory activity was also observed in the extract prepared using 70% ethanol, with an IC₅₀ value of 29.75 ppm. Correlation analysis indicated that total phenolic content was not strongly correlated with antioxidant activity or lipase inhibition, whereas antioxidant activity exhibited a very strong positive correlation with lipase inhibitory activity.

Keywords: Matcha (*Camellia sinensis* L.), Total Phenolic Content, Antioxidant Activity, Lipase Inhibition, Solvent Variation

ISOLATION OF ALPHA-CELLULOSE, PREPARATION AND CHARACTERIZATION OF MICROCRYSTALLINE CELLULOSE FROM GELINGGANG (CASSIA ALATA L.) STEM FIBERS AS A TABLET BINDER

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ABSTRACT

[Gelinggang bark is a part of the plant that contains high levels of cellulose fiber, and has the potential to be used as a pharmaceutical raw material to produce microcrystalline cellulose (MCC). This research aims to isolate alpha-cellulose, prepare it, and determine the characterization of cellulose microcrystals produced from gelinggang bark fibers, then evaluate its potential as an excipient in paracetamol tablet formulations. Alpha-cellulose isolation was carried out using a 10% NaOH solution, followed by a hydrolysis process using 3.5 N HCL to produce MCC. Evaluation of the physical properties of MCC includes organoleptic tests, water content, degree of acidity, melting point, flow speed and angle of repose. MCC characterization includes Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Particle Size Analyzer (PSA) and Differential Scanning Calorimetry (DSC) tests. The resulting MCC is then used as an excipient in the formulation of paracetamol tablets accompanied by physical test evaluation of the tablets. The evaluation of the cellulose microcrystal test will be compared with the excipient on the market, namely Avicel 102.

The research results showed that MCC produced from gelinggang bark had the characteristics of a fine powder, light brown in color and odorless, a water content of 3.19%, an acidity degree of 5.22, a flow speed of 18.76 g/second and an angle of repose of 25.2°. FTIR characterization results show that MCC has an absorption pattern that resembles Avicel, with typical cellulose bands at wave numbers around 3300–3400 cm⁻¹ (O–H), 2900 cm⁻¹ (C–H), 1430 cm⁻¹ (CH₂), 1160 cm⁻¹ (C–O–C) and 1050–1030 cm⁻¹ (C–O). The XRD results of MCC have a crystallinity value of 26.6% and amorphous 73.4% and Avicel crystallinity 35.6% and amorphous 64.4%. SEM MCC particle results show an irregular morphology with a tendency to form dense aggregates, with the surface texture of the powder appearing rough and experiencing agglomeration, for Avicel it has angular flakes and porous aggregates, the surface is relatively smooth and evenly decomposed. The PSA test for MCC was 2692.4 nm and Avicel 1638.7 nm and the DSC test for MCC samples showed a very sharp and dominant endothermic peak at a temperature of 320.26°C compared to avicel at a peak of 340.35°C. The results of the evaluation of the physical properties of paracetamol tablets show that all parameters meet the requirements of the Indonesian pharmacopoeia.]

Keywords: Gelonggang stem; microcrystalline cellulose; Avicel; tablet

EVALUATION OF MEDICATION PLANNING AND INVENTORY AT PHARMACY X IN BOGOR USING ABC ANALYSIS

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ABSTRACT

Inaccurate medicine planning may create a mismatch between procurement and demand, tie up working capital, and increase expiry-related losses. This study evaluated medicine planning and inventory at Pharmacy X, Bogor, Indonesia, using ABC analysis and records of expired medicines. This retrospective, non-experimental descriptive study used pharmacy records for January–December 2025, reviewed during April–May 2026. Data included planning/procurement quantities, annual sales, unit acquisition prices, and expired-medicine records. Annual consumption value (ACV) was calculated as unit acquisition price multiplied by annual quantity sold. The 541 medicine items were classified according to their cumulative contribution to ACV. The pharmacy used consumption-based planning. Among selected items, absorption rates were 100% for Zycin (azitromisin) 500 and Alpentin (gabapentin) 100 mg, while Vitalong C (vitamin C) @4 and Rhinofed (pseudoefedrin HCl + triprolidin HCl) tablets had rates of 66.00% and 66.67%, respectively. These differences warrant further review but do not independently establish closing stock or overstocking. Six expired-medicine records were associated with a reported actual financial loss of IDR 933,246.15. Group A comprised 28 items (5.18%) and accounted for 69.60% of ACV; Group B comprised 138 items (25.51%) and accounted for 20.37%; and Group C comprised 375 items (69.31%) and accounted for 10.03%. The findings show that a small proportion of items accounted for most annual consumption value, while the large number of Group C items supports proportionate monitoring across categories. Regular review of consumption, procurement quantities, and expiry dates, supported by first-expired, first-out (FEFO) and near-expiry warning lists, is recommended. As a descriptive study at one pharmacy, the findings characterize local inventory patterns and do not establish causal relationships.

Keywords: ABC analysis; medicine planning; inventory management; expired medicines; pharmacy

Conference scope: Health and Life Sciences

ANTIFUNGAL ACTIVITY OF NUTMEG SEED (MYRISTICA FRAGRANS HOUTT.) EXTRACT GEL FORMULATED WITH TARO STARCH (COLOCASIA ESCULENTA (L.) SCHOTT) AGAINST TRICHOPHYTON MENTAGROPHYTES: A POTENTIAL TOPICAL APPROACH FOR FELINE DERMATOPHYTOSIS

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ABSTRACT

Feline dermatophytosis is a fungal skin infection with zoonotic implications, and Trichophyton mentagrophytes is one associated dermatophyte. Nutmeg seed (*Myristica fragrans* Houtt.) contains secondary metabolites with potential antifungal activity, while taro starch (*Colocasia esculenta* (L.) Schott) may serve as a natural gelling agent. This study aimed to evaluate the physical characteristics and antifungal activity of nutmeg seed extract gel formulated with taro starch against *T. mentagrophytes*. An experimental laboratory study was conducted using three formulations containing 0% (F0), 2.5% (F1), and 5% (F2) nutmeg seed extract, with 8% taro starch as the gelling agent. The formulations were evaluated for organoleptic characteristics, homogeneity, pH, viscosity, spreadability, and adhesion. Antifungal activity was assessed using well diffusion, with 2% ketoconazole as the positive control. F0 showed no inhibition zone, whereas F1 and F2 produced inhibition zones of 12.53 ± 0.16 mm and 15.67 ± 0.45 mm, respectively. The positive control produced an inhibition zone of 38.50 ± 0.20 mm. Statistical analysis showed significant differences among formulations. F2 exhibited the highest antifungal activity and was evaluated using a six-cycle cycling test at 4°C and 40°C. Physical instability was observed, including phase separation and loss of homogeneity from cycle three, decreased pH from cycle four, and viscosity below the requirement by cycle six. These findings indicate that 8% taro starch provides acceptable initial physical characteristics, while 5% nutmeg seed extract demonstrates antifungal activity against *T. mentagrophytes*. Further formulation optimization is needed to improve physical stability before in vivo evaluation for potential application in feline dermatophytosis.

Keywords: nutmeg seed; taro starch; antifungal gel; Trichophyton mentagrophytes; feline dermatophytosis

DEVELOPMENT AND VALIDATION OF A NEW CHAOTIC JERK-BASED ENCRYPTION MODEL FOR BLOCKCHAIN-BASED E-VOTING SYSTEMS

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ABSTRACT

Feline dermatophytosis is a fungal skin infection with zoonotic implications, and *Trichophyton mentagrophytes* is one associated dermatophyte. Nutmeg seed (*Myristica fragrans* Houutt.) contains secondary metabolites with potential antifungal activity, while taro starch (*Colocasia esculenta* (L.) Schott) may serve as a natural gelling agent. This study aimed to evaluate the physical characteristics and antifungal activity of nutmeg seed extract gel formulated with taro starch against *T. mentagrophytes*. An experimental laboratory study was conducted using three formulations containing 0% (F0), 2.5% (F1), and 5% (F2) nutmeg seed extract, with 8% taro starch as the gelling agent. The formulations were evaluated for organoleptic characteristics, homogeneity, pH, viscosity, spreadability, and adhesion. Antifungal activity was assessed using well diffusion, with 2% ketoconazole as the positive control. F0 showed no inhibition zone, whereas F1 and F2 produced inhibition zones of 12.53 ± 0.16 mm and 15.67 ± 0.45 mm, respectively. The positive control produced an inhibition zone of 38.50 ± 0.20 mm. Statistical analysis showed significant differences among formulations. F2 exhibited the highest antifungal activity and was evaluated using a six-cycle cycling test at 4°C and 40°C. Physical instability was observed, including phase separation and loss of homogeneity from cycle three, decreased pH from cycle four, and viscosity below the requirement by cycle six. These findings indicate that 8% taro starch provides acceptable initial physical characteristics, while 5% nutmeg seed extract demonstrates antifungal activity against *T. mentagrophytes*. Further formulation optimization is needed to improve physical stability before in vivo evaluation for potential application in feline dermatophytosis.

Keywords: nutmeg seed; taro starch; antifungal gel; *Trichophyton mentagrophytes*; feline dermatophytosis

STUDY OF GREEN-SYNTHEZIZED TiO₂ PHOTOANODES USING TARO LEAF EXTRACT (*Colocasia esculenta* L.) AND ANTHOCYANIN SENSITIZERS FROM BUTTERFLY PEA AND ROSELLA FLOWERS IN DYE-SENSITIZED SOLAR CELLS (DSSC)

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ABSTRACT

This study aims to evaluate the effect of the physicochemical characteristics of TiO₂ photoanodes synthesized via green synthesis using taro leaf extract (*Colocasia esculenta* L.) (TiO₂-CELEs) and commercial anatase TiO₂ on the performance of dye-sensitized solar cells (DSSCs) based on natural anthocyanin sensitizers from butterfly pea flowers (*Clitoria ternatea* L.) and roselle flowers (*Hibiscus sabdariffa* L.). The photoanode characteristics were evaluated using linear sweep voltammetry (LSV), cyclic voltammetry (CV) to estimate the electrochemically active surface area (ECSA), and multi-pulse amperometry (MPA) to examine the current response under illumination. Optical characteristics and functional groups were analyzed using UV-Vis diffuse reflectance spectroscopy (UV-Vis DRS) and Fourier-transform infrared spectroscopy (FTIR). The DSSC performance was evaluated based on current-voltage (I-V) curves, open-circuit voltage (Voc), short-circuit current density (Jsc), fill factor (FF), and power conversion efficiency. Characterization results showed that TiO₂-CELEs possessed an ECSA of 4.31 cm², which is higher than that of commercial anatase TiO₂ at 1.61 cm². Photoanode characterization after sensitization revealed changes in optical absorption characteristics and vibrational bands associated with anthocyanin functional groups, indicating an interaction between the sensitizer and the TiO₂ surface. In TiO₂-CELEs-based DSSCs, the use of butterfly pea anthocyanin yielded a power conversion efficiency of 0.0257%, a Voc of 0.800 V, an FF of 0.3360, and a short-circuit current of 3.80×10⁻⁶ A. Meanwhile, the use of roselle anthocyanin yielded an efficiency of 0.0246%, a Voc of 0.792 V, an FF of 0.4184, and a short-circuit current of 2.95×10⁻⁶ A. These results indicate that the butterfly pea sensitizer produced higher power conversion efficiency and short-circuit current on the TiO₂-CELEs photoanode, whereas the roselle sensitizer resulted in a larger FF. Overall, this study evaluates the potential of green-synthesized TiO₂ as a photoanode for natural sensitizer-based DSSCs through the correlation of its electrochemical and optical characteristics with device performance. Performance comparison against commercial anatase TiO₂ is necessary to determine the extent to which the green synthesis approach provides advantages at the device level.

Keywords: Dye-Sensitized Solar Cell (DSSC), TiO₂-CELEs Photoanode, Anthocyanin, Butterfly Pea Flower, Roselle Flower, Physicochemical Characterization, Photovoltaic Performance.

SUBCHRONIC TOXICITY TEST OF A 96% ETHANOL EXTRACT OF RUMPUT KEBAR (BIOPHYTUM UMBRACULUM WELW.) IN MICE (MUS MUSCULUS)

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ABSTRACT

Introduction: Biophytum umbraculum Welw. (rumpup kebar) is a medicinal plant traditionally used by Papuan communities, particularly for female reproductive health. However, information regarding the safety of repeated exposure to its ethanol extract remains limited.

Purpose: This study aimed to evaluate the subchronic toxicity of a 96% ethanol extract of rumpup kebar in male and female mice (*Mus musculus*) after 28 days of repeated oral administration.

Methods: Forty BALB/c mice (20 males and 20 females) were divided into four groups: 0.5% Na-CMC as the control and extract doses of 500, 1000, and 2000 mg/kg body weight. The extract was administered orally once daily for 28 days. Clinical signs and body weight were monitored during treatment. On day 29, serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), and creatinine were measured. Statistical analysis was performed using appropriate parametric or non-parametric tests.

Results: No apparent clinical signs of toxicity were observed in any group. Body-weight changes varied according to sex and dose, with a more pronounced reduction observed in males receiving 2000 mg/kg body weight. No significant differences were found in ALT and AST levels among male groups. However, creatinine levels differed significantly in males, with an increase at 2000 mg/kg body weight. In females, no significant differences were observed in the measured biochemical parameters.

Conclusion: The 96% ethanol extract of *B. umbraculum* administered orally at 500–2000 mg/kg body weight for 28 days showed no apparent clinical toxicity or significant hepatic biochemical alterations. Nevertheless, the increased creatinine level in males at 2000 mg/kg body weight indicates a possible mild renal effect that warrants further investigation.

Keywords: Biophytum umbraculum, rumpup kebar, subchronic toxicity, ethanol extract, mice, ALT, AST, creatinine.

IMPLEMENTATION OF MOBILE REMOTE CONTROL ROBOT USING ANDROID-BASED SOLAR PANELS

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ABSTRACT

The increasing demand for energy due to technological and industrial developments encourages the search for environmentally friendly energy solutions. Renewable energy, particularly those sourced from the sun, offers great potential to replace the depleting reliance on fossil fuels. As a form of innovation in the field of robotics, this Android-based mobile remote control robot is designed to use monocrystalline solar panels with a capacity of 2WP as the main energy source, with batteries as additional power storage. This robot system integrates an Arduino Uno microcontroller for data processing and an HC-05 Bluetooth module that can control the robot remotely via an Android app. By harnessing solar energy through solar panels, robots can reduce reliance on conventional batteries, while improving energy efficiency. The trial was conducted to evaluate the performance of the system, including the measurement of voltage, current, and efficiency of the solar panels. This research aims to contribute to the development of environmentally friendly robotics technology by utilizing solar energy. The results of this study show that the designed system can work according to planning and has the potential to be further developed.

Keywords— Mobile Remote Control Robot; Renewable Energy; Monocrystalline; Android; Battery.

LIGNIN-MODIFIED TiO₂ PHOTOANODES WITH ENHANCED ELECTROCHEMICALLY ACTIVE SURFACE AREA FOR BUTTERFLY PEA (*Clitoria ternatea* L.) ANTHOCYANIN-SENSITIZED DYE-SENSITIZED SOLAR CELLS (DSSC)

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ABSTRACT

Dye-sensitized solar cells (DSSCs) based on natural dyes are attractive because they are low-cost and environmentally friendly. However, their efficiency remains low because the photoanode has a limited active surface area and the dye binds poorly to the semiconductor. This study aimed to develop a lignin-modified TiO₂ photoanode for DSSCs, sensitized with anthocyanin extracted from butterfly pea (*Clitoria ternatea*) flowers. Mixed-phase anatase-rutile TiO₂ was modified with lignin at lignin-to-TiO₂ ratios of 0, 0.5, 1.5, 3, and 5.5%. The films were deposited onto FTO substrates and then immersed in the anthocyanin extract as the sensitizer. The photoanodes were characterized by FTIR spectroscopy and by cyclic voltammetry (CV) in 1 mM K₃Fe(CN)₆/0.1 M KCl at scan rates of 10–120 mV/s. The electrochemically active surface area (ECSA) was calculated using the Randles-Sevcik equation. FTIR spectra showed dominant Ti–O–Ti/Sn–O bands (700–500 cm⁻¹), along with aromatic C=C (~1600–1500 cm⁻¹) and C–O/C–O–C (~1200–1000 cm⁻¹) bands, indicating that lignin and anthocyanin were adsorbed on the TiO₂ surface. The peak current was linearly proportional to the square root of the scan rate ($R^2 = 0.982–0.9998$), indicating a diffusion-controlled charge-transfer process. The addition of 1.5% lignin gave the highest ECSA of 1.61 cm², about 49% higher than that of bare TiO₂ (1.08 cm²). Ratios of 3% and 5.5% each gave 1.35 cm², whereas 0.5% lignin gave no improvement (1.07 cm²). The larger ECSA provides more sites for dye adsorption and interfacial electron transfer. The TiO₂-lignin 1.5% photoanode therefore has the potential to improve the performance of natural dye-based DSSCs. As an abundant waste biopolymer, lignin offers a low-cost and sustainable modifier for DSSC photoanodes

Keywords: DSSC, photoanode, TiO₂, lignin, anthocyanin, butterfly pea, ECSA

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

IDENTIFICATION OF DIACETYL IN E-LIQUIDS SOLD IN BOGOR CITY USING GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)

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ABSTRACT

Vape use in Indonesia continues to rise, driven by the perception that vaping is safer than conventional smoking and by the wide variety of available flavors. However, e-liquids may contain hazardous compounds, one of which is diacetyl (2,3-butanedione), a flavoring agent with a buttery or creamy aroma. Diacetyl is considered safe by the FDA for oral consumption, but inhalation exposure has been associated with bronchiolitis obliterans (popcorn lung). Previous studies have analyzed the main components of e-liquids, such as propylene glycol, and have confirmed the presence of diacetyl in samples from other countries. This study aimed to identify the presence of diacetyl in e-liquids sold at vape stores in Central Bogor using gas chromatography-mass spectrometry (GC-MS). The results showed no chromatographic peak or mass spectrum matching the diacetyl standard in any of the samples tested; therefore, diacetyl was not detected. Nevertheless, various flavor compounds were identified, including acetoin, esters, and several other volatile compounds that contribute to the sweet, creamy, fruity, and bakery aroma characteristics of the e-liquids. The creamy and buttery flavor characteristics of the samples are presumed to originate from a combination of the other identified flavor compounds rather than from the use of diacetyl. These findings indicate that flavor compounds other than diacetyl contribute to the aroma profile of e-liquids.

Keywords: diacetyl, e-liquid, GC-MS, flavoring compounds, popcorn lung.

ANTI-CHOLESTEROL ACTIVITY AND MOLECULAR DOCKING OF SECONDARY METABOLITE OF KETAPANG LEAF EXTRACTS (*Terminalia catappa* L.)

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ABSTRACT

One of the secondary metabolites contained in ketapang leaves is flavonoids which are reported to have potential as a source of natural antioxidants. Based on several studies it is known that antioxidants can be used as a source of anti-cholesterol. Therefore, this research was designed to determine antioxidant and anti-cholesterol activity in vitro and in silico through molecular docking simulations. This research began with the extraction of the maceration method using various solvents such as distilled water, 96% ethanol, 96% isopropanol, and 96% methanol, then the total flavonoids and antioxidant activity were determined using the DPPH method, the extract with the best antioxidant activity was tested for its anti-cholesterol activity using the Lieberman-Burchard method and the secondary metabolites were identified by LC-MS/MS. Furthermore, docking simulations were carried out between the flavonoid compounds identified by LC-MS/MS as ligands and the HMG-CoA reductase enzyme as the receptor. The results showed that the methanol extract had the highest antioxidant activity compared to other extracts which had an IC 50 value of 22.46 ppm with a total flavonoid content of 46.24 mgQE/g, anti-cholesterol activity obtained an EC 50 value of 88.76 ppm for the methanol extract of ketapang leaves, while the simvastatin drug control was 50.91 ppm. The compounds identified in the methanol extract were 12 flavonoid compounds including catechins, gambirin B3, quercetin, rutin, isorhamnetin, quercitrin, naringenin, procyanidin A2, kaempferol, crisimarin, apigenin, and krisiliol. The docking simulation results for the HMG-CoA reductase enzyme yielded the best affinity energy, namely the naringenin compound of -9.1 kcal/mol and the simvastatin control of -7.5 kcal/mol. Based on this, flavonoid compounds are thought to act as antioxidants and also have potential as anti-cholesterol.

Keywords: antioxidant; anti-cholesterol; ketapang leaves; flavonoid; *Terminalia catappa* L.

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

ASSOCIATION BETWEEN PHARMACIST COUNSELING AND MEDICATION ADHERENCE AMONG PATIENTS WITH HYPERTENSION: A CROSS-SECTIONAL STUDY USING ELECTRONIC MEDICAL RECORDS AT PASIR MULYA HEALTH CENTER, BOGOR, INDONESIA

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ABSTRACT

Medication adherence and effective blood pressure control are essential to achieving optimal outcomes in hypertension management. A community health center is a healthcare facility that implements an Electronic Medical Record (EMR) system. This study aimed to evaluate the effect of pharmacist counseling on medication adherence among patients with hypertension at Pasir Mulya Community Health Center Bogor. This study employed a cross-sectional design using retrospective electronic medical record data collected from January to December 2025, involving a total of 3,990 patients. Study subjects were selected based on patients electronic medical records, with medication adherence assessed according to the pharmacist's evaluation of therapeutic outcomes, as indicated by the achievement of the target blood pressure. Data extraction was performed during September 2026. Univariate analysis showed that the majority of patients with hypertension were female (2,969 patients; 74.4%), with patients ranging in age from 25 to 80 years. The results of the Chi-square analysis demonstrated a statistically significant association between pharmacist counseling and medication adherence ($p < 0.001$). These findings indicate that pharmacist counseling is significantly associated with medication adherence among patients with hypertension at Pasir Mulya Community Health Center Bogor.

Keywords: hypertension; medication adherence; pharmacist counseling; blood pressure

COMPARATIVE PHYTOCHEMICAL PROFILING AND BIOLOGICAL ACTIVITIES OF THREE MIMOSA SPECIES: AN UNTARGETED METABOLOMICS APPROACH

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ABSTRACT

Mimosa pudica, Mimosa pigra, and Mimosa diplotricha have long been used in traditional medicine to treat various health conditions, including diabetes and gout. However, evidence presently comparing their phytochemical profiles with their biological activities remains limited. This study compared their phytochemical contents and biological activities such as antioxidants (DPPH and FRAP assays), α -glucosidase inhibition, and xanthine oxidase inhibition, and explored putative metabolites associated with biological activities using untargeted LC-MS/MS metabolomics. Ethanolic extracts were evaluated, and significant interspecific differences were observed ($p < 0.05$). *M. pigra* showed the highest TPC (138.96 ± 4.69 mg GAE g⁻¹ extract), FRAP value (1.56 ± 0.04 mmol TE g⁻¹ extract), α -glucosidase inhibitory activity ($IC_{50} = 4.71 \pm 1.42$ mg L⁻¹), and xanthine oxidase inhibitory activity ($IC_{50} = 27.53 \pm 1.49$ mg L⁻¹). In contrast, *M. pudica* showed the highest TFC (35.96 ± 1.26 mg QE g⁻¹ extract) and DPPH radical-scavenging activity ($IC_{50} = 16.59 \pm 1.20$ mg L⁻¹). Pearson correlation analysis showed a strong negative correlation between FRAP and α -glucosidase IC_{50} values ($r = -0.893$, $p = 0.0012$). Metabolomics further provided putative annotations associated with the activities, supporting future phytopharmaceutical investigations.

Keywords: antioxidant activity; α -glucosidase inhibition; xanthine oxidase inhibition; LC-MS/MS; metabolomics

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

ANALYSIS OF UNCERTAINTY IN GOLD PRICE MOVEMENTS USING THE QUANTILE RANDOM FOREST METHOD

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ABSTRACT

Gold price fluctuations make point predictions insufficient to fully represent the risks and uncertainty associated with future prices. This study aims to analyze uncertainty in gold price movements using the Time Series Quantile Random Forest (tsQRF) method and implement the model in a web-based application. The data consist of secondary daily Gold Futures (GC=F) price data obtained from Investing.com, comprising 1,468 observations from January 4, 2021, to October 15, 2026. The research stages include data validation, preprocessing, lag feature construction, chronological data splitting, model development, and evaluation. The dataset is divided into training and testing sets using an 80:20 ratio, resulting in 1,171 training observations and 293 testing observations. The model is constructed using 500 decision trees to predict the next day's closing price through three quantiles: Q10 as the lower bound, Q50 as the median prediction, and Q90 as the upper bound, thereby producing a range of predicted prices. The evaluation results show that the Q50 prediction achieves a Mean Absolute Error (MAE) of 55.34 and a Root Mean Squared Error (RMSE) of 79.39. Meanwhile, the Q10–Q90 prediction interval achieves a coverage of 53.24%, with an average interval width of 94. These findings indicate that the median prediction can follow the general pattern of gold price movements; however, the prediction interval does not cover actual prices at the nominal target level of 80%, indicating that the resulting interval is too narrow. The seven-trading-day forecast can therefore be interpreted as an indication of the possible price range and associated uncertainty, rather than a guarantee of future prices. The model is implemented in a Laravel-based website that provides data management, model retraining, evaluation, and prediction results. In conclusion, the tsQRF method can be used to analyze uncertainty in gold prices, although further calibration is needed to improve the coverage of the prediction interval.

Keywords: gold prices, uncertainty, time series, Quantile Random Forest, prediction interval.

PIPER-DERIVED COMPOUNDS IN CERVICAL CANCER: A CRITICAL REVIEW OF SELECTED EVIDENCE ON CHEMISTRY, BIOACTIVITY, AND TRANSLATIONAL GAPS

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ABSTRACT

Piper-derived compounds offer chemically diverse starting points for cervical-cancer research. This critical review integrates a Piper-focused PubMed search with supplied Scopus and Web of Science summaries, distinguishing source abstracts from selectively verified full-text data. The selected evidence spans isolated amides and lignanamides, piperine and piperlongumine analogues, and delivery systems. Reported outcomes include growth inhibition, apoptosis, redox disturbance, chemotherapy potentiation, and formulation-associated enhancement. Interpretation depends on chemical provenance, the specific cell model, assay endpoint, exposure duration, and comparator. Important limitations include incomplete full-text verification, uncertain tissue selectivity, heterogeneous combination analyses, and the transfer of mechanistic findings from noncervical models. Docking predictions and cellular efficacy do not establish direct target engagement or systemic bioavailability. Priorities are matched chemistry–activity comparisons, authenticated models, causal experiments, and exposure-supported mammalian efficacy and safety. The synthesis evaluates selected preclinical evidence without claiming exhaustive coverage or clinical effectiveness.

Keywords: Piper; phytochemistry; cervical cancer; piperine; piperlongumine; chemosensitization

DEVELOPMENT OF BATIK EDUCATIONAL GAMES WITH AN AR-BASED HYBRID APPROACH USING ANT COLONY OPTIMIZATION ALGORITHM

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ABSTRACT

This research developed an educational game "Batik Explorer," which aims to increase interest in learning and preserve the local culture of Batik Kemang through a hybrid approach that combines Augmented Reality (AR) and Non-AR (virtual 3D). The Game Development Life Cycle (GDLC) method was used in its development. The hybrid feature is designed to overcome the limitations of AR in low-light conditions or the absence of physical markers, allowing for more flexible learning. To improve interactivity and navigation, the Ant Colony Optimization (ACO) algorithm was implemented as a dynamic pathfinding method in the maze environment and a hint feature in the batik puzzle. Functionality tests using the black-box method showed that all features were running well. The usability evaluation with the System Usability Scale (SUS) received an average score of 75.75. This value is in the category of Good/Acceptable. This means that the interface is easy to use and effective. The results of the study show that this hybrid educational game succeeds in presenting cultural materials in an interesting and interactive manner, as well as that the ACO algorithm is effective in route optimization. This implementation is expected to be an innovative learning medium for the introduction and preservation of Kemang Batik among the younger generation.

Keywords: Educational Games, Mango Batik, Augmented Reality (AR), Hybrid, Ant Colony Optimization (ACO), Pathfinding

Conference scope: Artificial Intelligence and Data Science in Natural Sciences

DEVELOPMENT OF RED BETEL LEAF AUTHENTICATION METHOD USING A COMBINATION OF FTIR-ATR AND UV-VIS SPECTRUM DATA FUSION WITH CHEMOMETRICS

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ABSTRACT

Authenticating herbal raw materials is essential to ensure species identity and product quality, especially when closely related plants may be mixed or substituted. This study aimed to develop an authentication method for red betel leaves (*Piper crocatum* Ruiz & Pav.) using Fourier transform infrared–attenuated total reflectance (FTIR-ATR) and ultraviolet–visible (UV-Vis) spectra, along with chemometric analysis. We analyzed red betel samples from three geographic locations and green betel leaves (*Piper betle* L.) from two locations as pure samples and as mixtures containing 5%, 25%, or 50% green betel adulterant. We analyzed ethanol extracts using FTIR-ATR at 4000–400 cm^{-1} and UV-Vis spectrophotometry at 200–800 nm. We preprocessed spectral data using the Savitzky–Golay method and evaluated them with principal component analysis (PCA) and orthogonal partial least squares-discriminant analysis (OPLS-DA). The spectra showed differences in absorbance patterns and peak intensities between red and green betel, as well as among the mixtures. PCA indicated that preprocessing improved model performance for the individual spectral datasets, although some sample groups remained overlapping. OPLS-DA of the individual datasets showed limited predictive performance, particularly for UV-Vis data. We then applied low-level fusion of FTIR-ATR and UV-Vis spectral data. The fused-data OPLS-DA model with preprocessing yielded $R^2X = 0.955$, $R^2Y = 0.601$, and $Q^2 = 0.457$. The study indicates that combined FTIR-ATR and UV-Vis fingerprinting with chemometric analysis can support discrimination of pure red betel, pure green betel, and red betel samples adulterated with green betel. Further validation using independent samples is recommended to establish the model's predictive reliability for routine authentication.

Keywords: red betel; green betel; authentication; FTIR-ATR; UV-Vis; data fusion; chemometrics; OPLS-DA

A BEYOND THE ESG LABEL: A REVIEW AND MACHINE LEARNING FRAMEWORK FOR CLUSTERING INDONESIAN SUSTAINABLE STOCKS BY RISK AND RETURN

Yurika Permana Sari¹

ABSTRACT

The growing emphasis on sustainable investment calls for analytical tools that characterize sustainable financial assets beyond their sustainability label. This study reviews the literature on clustering stocks by risk–return characteristics, examines the design of sustainability indices on the Indonesia Stock Exchange (IDX), and proposes a reproducible machine-learning framework for grouping sustainable stocks. A structured narrative review of research on ESG and financial performance, stock clustering, and cluster validation is combined with a document analysis of IDX index methodologies and of publicly reported constituent and performance data for the IDX ESG Leaders index in 2023–2025. The indices differ markedly in universe, ESG assessor, and review calendar, and their membership changes at each major review. Within a single index, constituent returns are highly dispersed: in 2024 up to 20 August, year-to-date returns of the 30 IDX ESG Leaders constituents ranged from –38.4% to +82.9%, with a median of –3.2%, while the capitalization-weighted index rose by about 6.9%. Existing clustering studies, including Indonesian applications, use few features, choose the number of clusters by the elbow criterion, and rarely assess cluster stability. The proposed framework addresses these gaps by combining eight risk–return indicators, Principal Component Analysis (PCA), and K-means clustering with multi-index selection of the number of clusters, bootstrap stability assessment, sensitivity analysis, and point-in-time index membership. Rather than prescribing investment choices, the framework provides a transparent baseline for empirical research on sustainable portfolio construction, mathematical optimization, risk prediction, and explainable machine learning.

Keywords: sustainable finance; stock clustering; risk–return analysis; machine learning; PCA; Indonesia Stock Exchange

DETERMINATION OF TOTAL PHENOLIC AND TANNIN CONTENT IN CALABASH FRUIT JUICE (*Crescentia cujete* L.) AND ITS ACTIVITY AS A BIO-STARTER FOR HOUSEHOLD ORGANIC WASTE FERMENTATION

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Abstract

Background: Calabash fruit (*Crescentia cujete* L.) contains secondary metabolites, particularly phenolic compounds and tannins, which may influence microbial activity during fermentation. The concentrations of these compounds may change during fermentation, highlighting the need for chemical characterization before and after the process. Calabash fruit also has potential as a raw material for producing Local Microorganisms (MOL), which can be used as a bio-starter to accelerate household organic waste composting.

Objective: This study aimed to determine and compare the total phenolic and tannin contents of calabash fruit juice before and after fermentation, evaluate the biological characteristics of the resulting MOL based on total plate count (TPC), and analyze the effects of different MOL doses on the physical characteristics and composting time of household organic waste.

Methods: This experimental laboratory study used calabash fruit juice, which was initially subjected to phytochemical screening. Total phenolic content was determined using the Folin–Ciocalteu method with gallic acid as the standard, while total tannin content was determined using the Folin–Denis method with tannic acid as the standard, both measured by UV–Vis spectrophotometry. MOL was prepared by fermenting 200 mL of calabash fruit juice, 500 mL of rice-washing water, and 40 g of palm sugar for 15 days at room temperature. The fermentation process was evaluated through organoleptic observations of changes in color and aroma, as well as foam formation. The resulting MOL was further analyzed for total plate count (TPC) and total phenolic and tannin contents. Composting experiments were conducted using 150 g of household organic waste per experimental unit, with MOL doses of 20, 25, and 30 mL, EM4 as the positive control, and a treatment without MOL as the negative control. Each treatment was performed in five replicates. Composting parameters included changes in color, odor, texture, and composting time. Composting time data were analyzed using one-way analysis of variance (ANOVA), followed by Duncan's multiple range test at a 5% significance level.

Results: Phytochemical screening yielded positive results for alkaloids using Mayer's and Bouchardat's reagents, as well as for phenolic compounds, flavonoids, tannins, and saponins, while Dragendorff's reagent yielded a negative result. Total phenolic content decreased from 68.35 ± 4.42 mg GAE/g before fermentation to 2.100 ± 0.009 mg GAE/g after fermentation, representing a 96.93% decrease in measured content. Total tannin content decreased from 3.67 ± 0.25 to 1.746 ± 0.038 mg TAE/g, representing a 52.43% decrease. The resulting MOL had a TPC of 1.69×10^9 CFU/mL. MOL doses of 20, 25, and 30 mL resulted in composting times of 30.00 ± 1.00 , 27.00 ± 1.00 , and 24.00 ± 0.71 days, respectively. The EM4 treatment required 24.00 ± 0.71 days, whereas the negative control required 36.00 ± 1.23 days. The 30 mL MOL and EM4 treatments produced compost with a dark brownish-black color, an earthy odor, and a crumbly texture. One-way ANOVA revealed significant differences among treatments ($p < 0.001$). Duncan's multiple range test showed no statistically significant difference between the 30 mL MOL treatment and EM4, although both differed significantly from the other treatments.

Conclusion: Fermentation of calabash fruit juice for 15 days produced MOL with a 96.93% decrease in total phenolic content, a 52.43% decrease in total tannin content, and a TPC of 1.69×10^9 CFU/mL. The 30 mL MOL treatment resulted in a composting time of 24.00 ± 0.71 days, with no statistically significant difference compared with EM4 according to Duncan's test. Therefore, calabash fruit MOL has potential as an alternative bio-starter for accelerating household organic waste composting.

Keywords: calabash fruit, total phenolic content, total tannin content, local microorganisms, bio-starter, composting.

Sucrose esters and their derivatives: Advances in synthetic methodologies, biological activities, and applications

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ABSTRACT

Sucrose esters combine the versatility of a sugar-based structure with surfactant properties, making them promising candidates for industrial formulations and agricultural pest management. Their physicochemical properties and biological activities depend on molecular structure, particularly the nature and position of the attached acyl groups. This review examines chemical and enzymatic approaches to sucrose ester synthesis, including transesterification and acylation, with emphasis on catalyst selection, regioselectivity, and structure–property relationships. Relevant literature was identified through searches of Science direct, Scopus, RSC, ACS covering 2010 - 2026, focusing on studies of synthetic methods, molecular characteristics, biological activities, and applications. The review considers reported antimicrobial, nematocidal, and insecticidal activities, alongside proposed mechanisms such as membrane damage and disruption of insect cuticular barriers. Sucrose octanoate esters are discussed as examples of sucrose ester-based products used in registered biopesticide applications. Comparatively, chemical synthesis offers established routes with potential for production-scale application but may involve harsher reaction conditions and challenges in product selectivity. Enzymatic synthesis can provide milder reaction conditions and greater regioselectivity, although enzyme stability, catalytic efficiency, and cost may limit wider industrial implementation. This review aims to clarify the trade-offs between these approaches and identify outstanding questions concerning biological efficacy, toxicological profiles, and environmental behavior that must be addressed before the broader potential of sucrose esters in sustainable pest management can be established.

Keywords: Sucrose esters, chemical and enzymatic synthesis, structure–activity relationships, biological activity, biopesticides

Conference scope: Green Chemistry, Sustainable Materials, and Environmental Analysis

Presentation type: ☐ Oral presentation ☒ Poster presentation ☐ Student presentation

Evaluating the Performance of a Shallow Water Model for Tsunami Run-up and Coastal Inundation at Way Muli, Indonesia

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ABSTRACT

Predicting how far tsunami waves travel inland remains challenging, even when numerical models can reproduce the observed run-up height reasonably well. This difference is particularly important for coastal hazard assessment, where both the maximum water level and the extent of inundation influence the interpretation of tsunami impacts. This study examines the performance of a nonlinear Shallow Water Equations (SWE) model using the 2018 Sunda Strait tsunami data at Way Muli, South Lampung, Indonesia, as a case study. The equations are solved numerically using a finite difference method on a staggered grid, with an upwind scheme for the nonlinear terms and a wet-dry procedure to represent shoreline movement. Bathymetric data from the General Bathymetric Chart of the Oceans (GEBCO) are used to describe the coastal profile. The simulated run-up height and inundation distance are then compared with post-tsunami field observations. Under the selected wave conditions, the model produces a maximum run-up height of 6.01 m, giving a relative difference of approximately 4% as compared with the observed data (5.78 m height). The agreement is considerably weaker for inundation distance: the model predicts 50.06 m, whereas field observations indicate 348.3 m, an underestimation of approximately 85.6%. These results show that a close match in run-up height does not necessarily imply an accurate prediction of inland inundation. The discrepancy may be related to the simplified representation of coastal terrain and local features that affect overland flow. The findings identify limitations of the existing numerical model and provide a basis for improving coastal terrain representation and shoreline treatment in future extreme wave simulations.

Keywords: Tsunami run-up; Shallow Water Equations; numerical modeling; model performance; coastal inundation

Conference scope: Mathematics, Statistics, and Computational Modeling

Presentation type: ☐ Oral presentation ☒ Poster presentation ☐ Student presentation

HISTOPATHOLOGICAL EVALUATION OF KEBAR GRASS (*Biophytum umbraculum* Welw.) EXTRACT ADMINISTRATION IN RATS: RESULTS – A 90-DAY SUBCHRONIC TOXICITY STUDY

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ABSTRACT

Background: (*Biophytum umbraculum* Welw.), known as Kebar grass, is a medicinal plant traditionally used to support reproductive health. However, the safety of its use following long-term administration has not yet been adequately documented. This study evaluated the histopathology of organs in female Sprague-Dawley rats following 90 days of administration of Kebar grass extract.

Aim: This study aims to evaluate the histopathology of the liver, kidneys, lungs, uterus, ovaries, and mammary glands in female Sprague-Dawley rats following 90 days of administration of kebar grass extract.

Methods: Nine female Sprague-Dawley rats were divided into three groups (n = 3): a negative control group administered 0,5% sodium carboxymethyl cellulose (Na-CMC) and two treatment groups administered the extract at doses of 4,32 and 8,64 mg/200 g body weight. The extract was administered orally for 90 days. Assessments were conducted on body weight, macroscopic organ morphology, absolute organ weight, organ index, and histopathological scores of the liver, kidneys, lungs, uterus, ovaries, and mammary glands. Histological sections were stained with hematoxylin and eosin. Data were analyzed using appropriate statistical tests with a significance level of 0,05.

Results: Body weight remained relatively stable during the 14-day acclimatization period, with a coefficient of variation below 15%. No statistically significant differences were found among the groups in terms of final body weight, absolute organ weight, or organ index ($p > 0,05$). Macroscopic examination revealed changes in the surface and color of the lungs in one rat (T4) that received 4,32 mg/200 g body weight, while most other organs showed no noticeable abnormalities. Histopathological scores for the liver, ovaries, and mammary glands in the groups administered the extract were lower than those in the negative control group. In contrast, kidney scores increased with higher doses, while lung scores remained relatively high across all groups. Uterine scores were lower in both groups administered the extract compared to the negative control group, with identical average scores at both doses. Statistically significant differences in histopathological scores were observed only in the mammary glands ($p = 0,030$), while no significant differences were found in the other organs ($p > 0,05$).

Conclusion: Oral administration of *Biophytum umbraculum* Welw. extract at doses of 4.32 and 8.64 mg/200 g body weight for 90 days did not reveal any significant differences in body weight or organ weight parameters among the groups. Histopathological scores of the mammary glands showed significant differences and were lower in the groups administered the extract compared to the negative control group. Further research is needed to establish the safety profile of this extract.

Keywords: *Biophytum umbraculum* Welw.; Kebar grass; subchronic toxicity; histopathology; Sprague-Dawley.

ANTI-INFLAMMATORY ACTIVITY OF PURPLE LEAF TEA (*Graptophyllum pictum*) AT VARIOUS BREWING TEMPERATURES

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ABSTRACT

This study aims to analyze the effect of variations in brewing temperature (80°C, 90°C, and 100°C) on the organoleptic characteristics and anti-inflammatory activity of purple leaf tea (*Graptophyllum pictum*), as well as to identify bioactive compounds at the optimum temperature. Organoleptic tests were conducted using a hedonic test on 20 panelists, anti-inflammatory activity was analyzed using the BSA protein denaturation inhibition method, and compound identification was carried out using LC-MS/MS. The results showed that brewing temperature affected sensory acceptance and anti-inflammatory activity. A temperature of 90°C gave the best results with the highest level of preference (aroma 4.15; color 3.90; taste 4.25) and anti-inflammatory activity of 17.18%, higher than temperatures of 80°C (13.98%) and 100°C (9.88%). LC-MS/MS analysis of the 90°C brew identified apiin as the dominant compound, along with fraxetin and three phenolic compounds with potential anti-inflammatory activity. It was concluded that a brewing temperature of 90°C is the optimum condition for producing purple leaf tea with the best sensory characteristics and anti-inflammatory potential.

Keywords: Purple Leaf (*Graptophyllum pictum*), Brewing Temperature, Anti-Inflammatory, Protein Denaturation, LC-MS/MS.

POTENTIAL HEMATOTOXICITY IN A SUBCHRONIC (90-DAY) TOXICITY STUDY OF KEBAR GRASS EXTRACT (*Biophytum umbraculum* Welw.) IN FEMALE SPRAGUE-DAWLEY RATS

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Abstract

Introduction: Kebar grass (*Biophytum umbraculum* Welw.) is a plant endemic to Papua that has traditionally been used to enhance fertility. The phytoestrogenic activity of secondary metabolites found in Kebar grass such as flavonoids, saponins, and tannins supports its potential as a fertility treatment. However, there are concerns that repeated long-term use may cause unwanted side effects, including hematotoxicity affecting the hematological system. Therefore, a 90-day subchronic safety study was conducted.

Purpose: This study aimed to evaluate the potential hematotoxic effects of kebar grass extract based on quantitative hematological parameters and microscopic morphological characteristics of blood cells following repeated administration of effective doses over 90 days.

Methods: Nine female Sprague Dawley rats were acclimatized for 14 days and divided into three groups (n = 3): a negative control (0.5% Na-CMC), and extract doses of 4.32 and 8.64 mg/200 g body weight. The treatments were given orally once daily for 90 days. Clinical signs were observed daily. Blood was collected from the lateral tail vein on days 0, 30, 60, and 90 for hematological analysis (erythrocytes, hemoglobin, hematocrit, MCV, MCH, MCHC, leukocytes with differential count, and platelets) and for Giemsa-stained blood smears. Group differences on day 90 were analyzed using one-way ANOVA or Kruskal–Wallis test, and changes between day 0 and day 90 within each group were analyzed using paired t-test.

Results: Based on the observation of clinical symptoms, no clinical signs indicating toxicity were found in any of the groups during the 90-day administration of kebar grass extract. Blood smear examination using Giemsa staining revealed normal erythrocyte morphology with no echinocytes, dacryocytes, helmet cells, elliptocytes, or ovalocytes, and no toxic granules were found in the leukocytes. Most hematological parameters were within the normal range, although MCH levels were slightly below the normal range on days 60 and 90 in all treatment groups, and white blood cell counts exceeded the normal range at several observation time points. The results of one-way ANOVA and Kruskal-Wallis statistical analyses on day 90 showed no significant differences in any hematological parameters between the 0.5% Na-CMC negative control group and the treatment groups receiving the two doses of extract ($p > 0.05$). The results of the paired-sample t-test between day 0 and day 90 showed a decrease in white blood cell count in the 0.5% Na-CMC-negative control group from $9.80 \pm 1.66 \times 10^3/\mu\text{L}$ (day 0) to $15.10 \pm 0.92 \times 10^3/\mu\text{L}$ (on day 90), which was statistically significant ($p = 0.019$); lymphocyte percentage from $76.33 \pm 7.02\%$ to $57.33 \pm 12.66\%$ ($p = 0.033$) in the 8.64 mg/200 g BW dose group, and platelets from 824.67 ± 387.96 to $490.33 \pm 301.00 \times 10^3/\mu\text{L}$ ($p = 0.026$) in the 8.64 mg/200 g BW dose group. Although the results for these three parameters showed a statistically significant decrease, the white blood cell, lymphocyte, and platelet counts remained within the normal range. Overall, administration of kebar grass extract at doses of 4.32 and 8.64 mg/200 g body weight for 90 days showed no signs of significant hematotoxic effects in female Sprague Dawley rats.

Conclusion: Kebar grass extract administered at doses of 4.32 and 8.64 mg/200 g body weight for 90 days did not show any significant hematotoxic effects in female Sprague-Dawley rats. The decrease in the mean lymphocyte and platelet counts at the highest dose remained within the normal range; therefore, this decrease cannot be considered a hematotoxic effect.

Keywords: kebar grass, *Biophytum umbraculum*, subchronic toxicity, hematotoxicity, hematology

OPTIMIZATION OF METHYLENE BLUE PHOTODEGRADATION USING ZNO NANOPARTICLES BASED ON PAPAYA LEAF EXTRACT (CARICA PAPAYA L.) VIA RSM BOX-BEHNKEN DESIGN

Muhammad Rayhan Sutoyo¹

ABSTRACT

ZnO nanoparticles were synthesized via a green method using papaya (*Carica papaya* L.) leaf extract and calcined at 550 °C for 4 hours for the photodegradation of methylene blue. Characterization was performed using Fourier Transform Infrared Spectroscopy (FTIR) and Diffuse Reflectance Spectroscopy (DRS). The photodegradation of a 5 ppm methylene blue solution was optimized using Response Surface Methodology (RSM) with a Box–Behnken design, considering the variables of catalyst dosage, pH, and irradiation time. The FTIR spectrum revealed a Zn–O absorption band at 492–495 cm⁻¹, while the band gap energy of the ZnO was determined to be 3.02 eV. The optimum conditions were predicted to be a catalyst dosage of 1.00 g/L, a pH of 8.16, and an irradiation time of 121.21 minutes, yielding a degradation efficiency of 99.42%. The photodegradation kinetics followed a pseudo-first-order model ($R^2 = 0.9213$) better than a pseudo-second-order model ($R^2 = 0.6183$), with a rate constant of 0.0417 min⁻¹. Degradation efficiency decreased from 99.42% in the first use to 91.47% and 78.81% in the second and third uses, respectively. These results demonstrate the potential of green-synthesized ZnO as a photocatalyst for the degradation of methylene blue, with RSM serving as an effective approach for process optimization, while the decline in activity presents a challenge for catalyst reuse.

Keywords: photodegradation, methylene blue, ZnO nanoparticles, papaya leaf extract, RSM

Semi-Analytical Estimation of Extreme Wave Parameters for Coastal Run-Up and Tsunami Hazard Assessment

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ABSTRACT

The 2018 Sunda Strait tsunami, triggered by the volcanic flank collapse of Anak Krakatau, exposed a limitation of earthquake-based tsunami warning systems. Post-event surveys recorded maximum run-up and inundation, but not the time history of the waves that reached the coast. This motivates an inverse approach that uses the governing physics rather than relying solely on observed impact values. We investigate parameter recovery from the Carrier–Greenspan (CG) solution of the nonlinear shallow-water equations for non-breaking waves on a uniformly sloping beach. Two estimators are compared: direct closed-form formulas based on shoreline extrema and algebraic least squares using the full shoreline record. Both recover the amplitude, period and phase of the modeled shoreline response; neither identifies the unique incident wave of the 2018 event. Performance is assessed in 175 synthetic trials comprising five Gaussian position-noise levels and 35 realizations per level. At 0.05 m noise, median prediction RMSE over an independent 80 s interval is 0.112 m for the extrema method and 0.105 m for least squares. At 0.20 m noise, these errors increase to 0.608 m and 1.204 m, respectively, indicating that neither estimator is uniformly superior. The estimated parameters are also used to initialize a staggered-grid shallow-water solver on the same straight beach. Separately, grid refinement from 4 to 0.5 m reduces depth RMSE against the exact CG solution at 15 s from 0.0439 to 0.0072 m. Finally, four DEMNAS–BATNAS coastal profiles yield fitted beach slopes of 0.015–0.039 and elevation-fit RMSE of 0.74–1.50 m. These differences constrain the transfer of idealized CG estimates to Way Muli, where published survey maxima permit geometric checks but not unique reconstruction of the historical incoming wave.

Keywords: Carrier–Greenspan solution; closed-form parameter recovery; nonlinear shallow-water equations; wave run-up; coastal hazard assessment

Conference scope: Mathematics, Statistics, and Computational Modeling

Presentation type: ☐ Oral presentation ☐ Poster presentation ☐ Student presentation

Money Laundering Detection in Digital Financial Transactions Using Graph Neural Networks

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Abstract

Money laundering in digital financial transactions is difficult to detect because funds move quickly through complex networks of accounts. This study developed a transaction-level detection model based on graph neural networks (GNNs), specifically the graph attention network (GAT), with accounts as nodes and transactions as directed edges. The experiments used the dataset covering five laundering patterns: fan-out, fan-in, scatter-gather, gather-scatter, and simple cycle. The data, comprising 1,196,340 transactions from 319,187 accounts, were split chronologically into training, validation, and test sets. The model used three graph attention layers, was trained with a weighted focal loss to address class imbalance, and averaged the probabilities of three models trained with different seeds (ensemble). On 489,137 test transactions, the model achieved a precision of 0.9991, a recall of 0.9988, an F1-score of 0.9990, a false positive rate of 0.0147%, and a false negative rate of 0.1172%, with recall above 99% for every pattern. It produced fewer total errors than random forest and XGBoost (142 versus 155 and 148), although the margin was small. These results indicate that graph-based models can identify structural laundering patterns with very few false alerts.

Keywords: Anti-Money Laundering, Class Imbalance, Financial Transaction Networks, Graph Attention Network, Graph Neural Networks

INTENT CLASSIFICATION SYSTEM FOR USER TWEETS REGARDING ARTIFICIAL INTELLIGENCE (AI) ON PLATFORM X USING THE INDOBERT MODEL

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Abstract

The high volume of public opinion on Platform X regarding the development of Artificial Intelligence (AI) makes manual information extraction inefficient and prone to errors. Traditional sentiment analysis, which categorizes text merely into emotional polarities, is insufficient for comprehending users' pragmatic intentions. Therefore, this study aims to develop and implement a web-based intent classification system using the IndoBERT deep learning model. The dataset comprises 1,000 Indonesian tweets annotated into four intent categories: Complaint, Question, Appreciation, and Suggestion. This research employs the Knowledge Discovery in Databases (KDD) framework for Natural Language Processing (NLP) feature extraction and the Waterfall Software Development Life Cycle (SDLC) model for web application development. The IndoBERT model was fine-tuned using an 80:20 train-test split ratio. The confusion matrix evaluation demonstrates highly optimal model performance, achieving an overall accuracy of 90.86%, with weighted averages of 0.91 for precision, 0.905 for recall, and 0.907 for F1-score. To enhance practical utility, the best-performing model was integrated into an interactive web interface built with the Streamlit framework. This application enables end-users to perform both real-time single-text predictions and automated bulk data processing (CSV/Excel) without requiring programming expertise. This research confirms that IndoBERT is highly effective in handling social media linguistic ambiguity and is ready for deployment as a practical decision-support tool.

Keywords: Intent Classification, IndoBERT, Natural Language Processing, Streamlit, Artificial Intelligence Tweets, Platform X

Beyond Data-Driven Approaches: Mathematical Modelling of Extreme Wave Run-up for Coastal Hazard Assessment

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ABSTRACT

The increasing reliance on data-driven approaches in scientific research presents significant challenges in coastal hazard assessment, particularly for extreme events such as tsunamis, where historical observations are often sparse and incomplete. While data-driven methods are valuable for identifying patterns and making predictions, the application may be limited when observations do not adequately represent possible extreme scenarios. This study explores the role of physics-based mathematical modelling as a complementary framework for investigating extreme wave run-up under limited observational data. This study considers the use of the nonlinear Shallow Water Equations (SWE) to investigate extreme wave run-up in the tsunami-prone coastal area of Way Muli, South Lampung, Indonesia. The equations describe wave propagation and shoreline movement through the conservation of mass and momentum. As an initial demonstration, previous numerical simulations based on a finite difference method with a staggered grid are examined to illustrate how different incident wave conditions affect coastal responses. The simulations show that changes in wave amplitude and initial spatial distribution lead to different maximum run-up heights and inundation distances. Although these results do not establish the full range of possible tsunami impacts, they illustrate how a mathematical model can be used to investigate conditions beyond those directly documented in historical records. This approach provides a starting point for developing numerical scenarios involving coastal protection measures and time-dependent inundation. This study highlights the continuing relevance of fundamental mathematical principles in the data science era, demonstrating how physics-based modelling can complement limited observations and support the development of coastal hazard assessment strategies.

Keywords: Mathematical modelling; extreme wave run-up; data scarcity; Shallow Water Equations; coastal hazard assessment

Conference scope: Mathematics, Statistics, and Computational Modeling

Presentation type: ☐ Oral presentation ☐ Poster presentation ☐ Student presentation

ANTIHYPERTENSIVE ACTIVITY AND PRELIMINARY SAFETY EVALUATION OF MICROENCAPSULATED AFRICAN LEAF EXTRACT (*Vernonia amygdalina* Delile)

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Abstract

Hypertension is a non-communicable disease that is common in the community and causes serious health problems. The rising number of cases in Indonesia has prompted exploration of natural ingredients such as African leaf (*Vernonia amygdalina* Delile), whose flavonoids are known to inhibit angiotensin-converting enzyme activity. This study evaluated the antihypertensive activity and preliminary safety of microencapsulated African leaf extract in hypertensive rats. Thirty-five male Sprague Dawley rats were divided into seven groups (n = 7): normal control, negative control (Na-CMC 0.5%), positive control (captopril 0.45 mg/200 g BW), non-microencapsulated extract (100 mg/kg BW), and microencapsulated extract at 75, 100, and 150 mg/kg BW. Hypertension was induced with prednisone (1.5 mg/kg BW) and 2% NaCl for 14 days, followed by 14 days of oral treatment. Blood pressure and heart rate were measured every 7 days using a CODA® non-invasive device; serum SGPT, SGOT, and creatinine were measured on day 29. The most effective microencapsulated dose was 150 mg/kg BW, which lowered systolic pressure from 144.6 to 107.6 mmHg (25.6%), diastolic pressure from 105.0 to 75.9 mmHg (27.7%), and mean arterial pressure from 117.8 to 86.1 mmHg (26.9%), whereas the negative control remained hypertensive (145.4, 105.4, and 118.3 mmHg, respectively). Treated groups differed from the negative control ($p < 0.05$), and heart rate did not change consistently. At this dose, SGPT (63.2 U/L), SGOT (126.4 U/L), and creatinine (0.40 mg/dL) were comparable to the normal control (77.0 U/L, 178.8 U/L, and 0.35 mg/dL). Microencapsulated African leaf extract has antihypertensive activity with no evident hepatic or renal biochemical disturbance.

Keywords: *Vernonia amygdalina*; microencapsulation; antihypertensive; efficacy; safety

ANTHROPOMETRIC DESIGN AND CONCEPT SELECTION OF AN ESP32-BASED WEIGHING TROLLEY FOR MANUAL SACK HANDLING

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ABSTRACT

Sacks of grain, fertiliser, and feed are still moved by hand in many Indonesian warehouses, farms, and small enterprises, and conventional trolleys give workers no information about the load they push, so overloading and awkward postures persist and expose them to musculoskeletal disorders. This study aimed to design an ergonomic sack trolley with an integrated digital weighing function and to justify its configuration through anthropometric dimensioning and a structured concept-selection procedure. An engineering design approach was followed, and two alternatives were compared: a trolley with an ESP32 microcontroller, a load cell, and an HX711 amplifier, and a conventional ergonomic trolley without weighing. The comparison used the Bayes decision method with five weighted criteria, namely ergonomics, work safety, weighing accuracy, implementation cost, and ease of use. Key dimensions were derived from Indonesian anthropometric data at the 5th, 50th, and 95th percentiles, and the robustness of the selection was tested by one-at-a-time, threshold, and random weight perturbation. The weighing trolley scored 4.55 against 3.05 for the conventional trolley; it remained preferred unless the cost weight exceeded 0.51, more than three times its baseline value, and it ranked first in 91.8% of 100,000 random weight sets. The resulting design has a 40 kg capacity, a handle height of about 100 cm that is close to the median standing elbow height of 96.1 cm, a display within forward reach, and a buzzer that sounds when the measured weight reaches an operator-defined target, while the weighing electronics account for about one third of the material cost. By preventing overloading and inaccurate filling, the trolley supports worker health and reduces material losses, contributing to socially and resource-sustainable small-scale logistics. Combining percentile-based dimensioning with probability-weighted concept selection yields a low-cost, traceable design; quantitative accuracy and field usability tests are the next validation steps.

Keywords: anthropometry; Bayes decision method; ergonomic trolley; ESP32 load cell; manual material handling

Conference scope: Digital Technology

GAUSSIAN MIXTURE MODEL-BASED CLUSTERING OF GAMMA-RAY SIGNALS USING PULSE SHAPE DISCRIMINATION PARAMETERS

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ABSTRACT

Reliable characterization of gamma ray signal is important for digital radiation detection, particularly when electronic noises and low-amplitude events overlap with radiation-induced pulses. This study investigates the use of a Gaussian Mixture Model (GMM) for unsupervised clustering of gamma ray events based on pulse shape discrimination (PSD) parameters. Experimental data were obtained from sodium iodide doped with thallium (NaI(Tl)) scintillator detector using a CAEN DT 5751 digitizer and CoMPASS acquisition software, with Cadmiun-109 as the radioactive source. A Python-based extracted short and long pulse integrals and event status information. After event quality filtering, 193,940 of 206,646 recorded events (93.85%) were retained for analysis. The long pulse integral (Qlong) and PSD ratio were standardized and analyzed using a three-component GMM. The resulting cluster exhibited distinct patterns in the two-dimension feature distribution. The first cluster predominantly covered low-amplitude events with broad PSD variation and possible noise contributions. The second represented an intermediate-amplitude transition region, while the third consisted of higher-amplitude events exhibiting a comparatively narrow and stable PSD distribution. Visual examination supported the interpretation that the model captured meaningful statistical structures within the recorded events without requiring labeled training data. These preliminary findings suggest that GMM-based clustering can support the characterization of gamma-ray pulse distributions and provide a basis for subsequent validation of data-driven event selection in scintillation detection system.

Keywords: Gaussian Mixture Model; Pulse Shape Discrimination; Gamma-Ray Signals; NaI(Tl) Scintillator; Unsupervised Learning

Conference scope: Artificial Intelligence, Data Science, and Digital Technology

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

IMPACT OF TIMESTAMP FLAG SELECTION DURING LIST-MODE PREPROCESSING ON β - γ COINCIDENCE ACTIVITY DETERMINATION

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ABSTRACT

List-mode data preprocessing plays an important role in digital β - γ coincidence measurements because event-selection criteria can affect subsequent coincidence analysis and activity determination. This study investigates the influence of fine timestamp event selection on efficiency extrapolation and activity determination in a β - γ coincidence counting system. List-mode data obtained from a Co-60 measurement using a plastic scintillator coupled to a photomultiplier tube for beta detection and a NaI(Tl) detector for gamma detection were reprocessed using two approaches: without considering the event flag and by selecting only events with the fine timestamp flag, corresponding to a flag value of 0x0000. The same dead-time, resolving-time, gamma-energy-window, coincidence-processing, correction, and extrapolation parameters were applied to both approaches to isolate the effect of timestamp flag selection. Measurements from three source sample and three gamma-energy window settings were evaluated. The results show systematic differences between the efficiency extrapolation curves obtained with and without fine timestamp selection. The final activity concentrations obtained with fine timestamp selection were generally closer to the reference activity concentration of 155.4 ± 0.4 Bq mg⁻¹. Across the nine investigated source-position and gamma-energy-window combinations, fine timestamp selection reduced the average percentage error from 0.244% to 0.093%, with lower deviations from the reference value observed in eight of the nine conditions. These results demonstrate that timestamp flag selection at the preprocessing stage can propagate through coincidence analysis and efficiency extrapolation, affecting the final activity determination. The findings highlight the importance of explicitly considering timestamp information in the preprocessing of list-mode data for digital β - γ coincidence measurements.

Keywords: activity standardization; β - γ coincidence counting; post-processing; offline analysis; digital acquisition

Conference scope: Artificial Intelligence, Data Science, and Digital Technology

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

GAUSSIAN MIXTURE MODEL-BASED CLUSTERING OF GAMMA-RAY SIGNALS USING PULSE SHAPE DISCRIMINATION PARAMETERS

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ABSTRACT

Butterfly pea flowers (*Clitoria ternatea* L.) have the potential to be used as source of natural coloring in functional foods and beverages because they contain anthocyanins with antioxidant activity. The content and stability of anthocyanins are influenced by the extraction method and type of solvent. This study aimed to determine the effect of different solvents in the Ultrasonic-Assisted Extraction (UAE) method on the total anthocyanin content and antioxidant activity of butterfly pea flower extracts.

Extraction was performed using the UAE method with the following solvents: 70% ethanol, 96% ethanol, 70% ethanol with 1% HCl and 0.75% tartaric acid, 96% ethanol with 1% HCl and 0.75% tartaric acid, and distilled water. Total anthocyanin content was determined using the pH differential method, while antioxidant activity was determined using the DPPH method based on the IC₅₀ value.

The research results indicate that the highest total anthocyanin content was obtained using a 70% ethanol extract supplemented with 1% HCl and 0.75% tartaric acid, reaching 85.89 ± 0.255 mg/L, while the lowest content was found in the distilled water (aquadest) extract, at 34.68 ± 0.420 mg/L. Regarding antioxidant activity, as measured by IC₅₀ values, the 70% ethanol extract with 1% HCl and 0.75% tartaric acid exhibited the strongest antioxidant activity, with an IC₅₀ value of 62.07 ppm, whereas the 96% ethanol extract showed the lowest activity, with an IC₅₀ value of 150 ppm.

Keywords: Butterfly Pea Flower, *Clitoria ternatea* L., Ultrasonic Assisted Extraction, Anthocyanins, Antioxidants

STUDENTS' PERCEPTIONS OF REFLECTIVE LEARNING IN CASE-BASED SELF-MEDICATION PRACTICUM

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Abstract

Reflective learning enables students to evaluate performance, identify learning gaps, and improve professional practice. However, empirical evidence regarding how Diploma in Pharmacy students experience reflection after simulated self-medication encounters remains limited. This study explored students' perceptions of reflective learning following a case-based self-medication practicum, focusing on its perceived benefits, challenges, and implications for curriculum development. A qualitative descriptive approach was used. Data were collected through two focus group discussions with students who completed the practicum, and the transcripts were analyzed thematically. The findings revealed that students perceived reflection as a vital tool for self-evaluation, helping them identify performance gaps in information gathering, medication selection, patient communication, and referral decisions. While reflection enhanced their confidence, reduced anxiety, and eased the transition to real-world pharmacy internships, students faced logistical challenges such as post-practicum fatigue, procrastination, difficulty in written expression, and rigid template formats. To optimize this strategy, students suggested incorporating practical prompts, objective checklists derived from simulation evaluations, and utilizing audio/video recordings to aid recall. Reflective learning is a meaningful component of self-medication training because it fosters self-awareness and continuous improvement. These insights offer actionable guidance for designing a structured yet flexible reflection module that effectively bridges the gap between simulated learning and professional pharmacy practice.

Keywords: reflective learning; pharmacy education; self-medication; case-based learning; qualitative study

Conference scope: 6. Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: ☒ Oral presentation ☐ Poster presentation ☐ Student presentation

TERPENOIDS FROM THE LEAVES OF *Khaya anthotheca* AND THEIR ANTICANCER ACTIVITY AGAINST MCF-7 BREAST CANCER CELLS: IN VITRO AND IN SILICO STUDY

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Abstract

Terpenoids are one of the largest classes of secondary metabolites, exhibiting remarkable structural diversity and widespread occurrence in higher plants. The genus *Khaya* (Meliaceae) is a rich source of triterpenoids with various biological activities, including anticancer properties. This study aims to isolate and characterize triterpenoid compounds from the leaves of *Khaya anthotheca* and evaluate their anticancer potential against MCF-7 breast cancer cells through in vitro and in silico approaches. Dried leaves were extracted with ethanol, followed by solvent partitioning and chromatographic separation. Two triterpenoid compounds (Compound 1 and Compound 2) were successfully isolated from the n-hexane fraction. Structural elucidation was carried out using ¹H NMR, ¹³C NMR, and DEPT spectroscopy. The spectroscopic data confirmed that both compounds belong to the triterpenoid class, while comparison with previously reported spectroscopic data to determine their chemical identities is currently in progress. Cytotoxic evaluation using the MTT assay and molecular docking against selected breast cancer-related target proteins are currently underway. This study is expected to provide additional chemotaxonomic information on *Khaya* species and contribute to the discovery of triterpenoid-based lead compounds for breast cancer therapy.

Keywords: *Khaya anthotheca*, triterpenoids, MCF-7, anticancer, molecular docking.

A FRAMEWORK FOR MAPPING METABOLITE BIODIVERSITY IN INDONESIAN MEDICINAL PLANTS USED IN ETHNOMEDICINE AS A BASIS FOR PHARMACOGENOMICS: AN AI-ASSISTED SECONDARY DATA INTEGRATION APPROACH

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Abstract

Background: Indonesia is a megabiodiverse country characterized by exceptionally rich floral diversity, diverse ecosystems, and a wide range of ethnic groups with extensive traditional medicinal knowledge. Plant biodiversity represents a valuable source of potential drug candidates. However, the diversity of plant metabolites has not been comprehensively mapped in relation to ethnic diversity and the potential implications for drug responses and responses to plant-derived bioactive compounds. This study aimed to develop a framework for mapping metabolite diversity and molecular targets of Indonesian medicinal plants, establishing their pharmacological classifications, and analyzing their potential pharmacogenomic implications.

Methods: This study employed an integrative secondary data analysis approach following a workflow comprising ethnobotanical literature review → metabolite and bioactive compound diversity → biological targets and drug metabolism → variability in drug responses. Plant identities were verified using Plants of the World Online (POWO). Metabolite mapping was using KNApSACk, predicted pharmacological activities dan potential molecular targets using PASS Online, and potential target genes were identified using SwissTargetPrediction.

Results: Reference data documented 2,848 medicinal plant species used in 32,014 traditional medicinal formulations. A synthesis of 91 Indonesian ethnobotanical studies identified 3,202 use reports covering 791 medicinal plant species, of which 239 species were reported to be used by more than one ethnic group or across multiple provinces. Metabolite mapping of 10 widely used medicinal plants using KNApSACk identified a total of 1,191 compounds with molecular structure information. The reported compound counts included *Zingiber officinale* (635 compounds), *Curcuma longa* (190), *Curcuma xanthorrhiza* (35), *Piper betle* (12), *Orthosiphon aristatus* (13), *Psidium guajava* (311), *Carica papaya* (45), and *Foeniculum vulgare* (267), *M. calabura* (13). Chemical variation among geographical populations of the same species was also documented for *C. longa*. The predicted pharmacological activities and molecular targets of 10 selected bioactive compounds encompassed anti-inflammatory, antioxidant, anticancer, antidiabetic, antimicrobial, immunomodulatory, hepatoprotective, analgesic, and wound-healing effects. From a pharmacogenomic perspective, Indonesia comprises 633 ethnic groups. Secondary data from previous studies investigating CYP2C19 in Indonesian populations have reported variation in metabolizer phenotypes, including a poor-metabolizer, intermediate-metabolizer and rapid-metabolizer.

Conclusion: The biodiversity of Indonesian medicinal plants represents a substantial source of metabolite diversity, with potential chemical variation across geographical regions. Integrating ethnomedicinal, metabolomic, and pharmacogenomic data provides a conceptual basis for classifying medicinal plants into four categories: Core Ethnomedicine Plants, Chemical-Rich Plants, Ethnic-Specific Plants, and Pharmacogenomic Sensitive Plants. This framework may support the systematic identification of medicinal plant resources and the exploration of potential relationships between traditional medicinal practices, phytochemical diversity, and interindividual variability in drug responses. Further validation using primary studies and population-specific pharmacogenomic data is required to establish these relationships.

Keywords: CYP2C19; ethnobotany; plant biodiversity; pharmacogenomics.

COMPARATIVE ANALYSIS OF MOBILENETV3 AND EFFICIENTNET-B0 FOR MOBILE-BASED KOI FISH IMAGE CLASSIFICATION

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Abstract

Koi are valuable ornamental fish whose price depends on the correct identification of the variety, yet identification is still performed manually by experts and sellers, which is slow and prone to human error. This study aims to implement MobileNetV3, a lightweight convolutional neural network, to classify koi varieties from images, and to compare it with EfficientNet-B0 to determine the architecture that is more suitable for mobile devices. A primary dataset of 1,200 images was collected at a koi farm in Bogor, Indonesia, covering eight classes: seven koi varieties (Sanke, Showa, Kohaku, Chagoi, Bekko, Utsuri, and Tancho) and one non-koi class, with 150 images per class. The images were resized, normalized, and augmented, then divided into 70% training, 15% validation, and 15% testing data. Both models were trained with two-stage transfer learning, consisting of feature extraction followed by fine-tuning, and were evaluated using a confusion matrix. On 184 test images, MobileNetV3 achieved an accuracy of 95.65% and a macro F1-score of 95.62%, whereas EfficientNet-B0 achieved 92.93% and 92.88% in the final configuration. After conversion to TensorFlow Lite, MobileNetV3 was also smaller, at 12.92 MB compared with 17.39 MB. Most errors occurred among visually similar varieties, namely Sanke, Showa, and Tancho. The selected model was integrated into an Android application built with Flutter that classifies images directly on the device without an internet connection. A user acceptance test with 13 respondents produced an average index of 85.23%, categorized as very feasible. These results indicate that MobileNetV3 is an accurate and efficient choice for mobile koi classification.

Keywords: koi fish classification; MobileNetV3; EfficientNet-B0; transfer learning; mobile application

Conference scope: Artificial Intelligence, Data Science, and Digital Technology

REVIEWING SOLVENT TYPE ON ANTIOXIDANT ACTIVITY OF RED ALGAE EXTRACTS

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Abstract

Red algae of the genus *Gracilaria* are rich in phenolic compounds and flavonoids and are increasingly explored as sources of natural antioxidants, yet the solvent used for extraction strongly influences how much of these compounds is recovered. This review aimed to evaluate how solvent type affects the antioxidant activity of red algae extracts and how this activity relates to total phenolic and total flavonoid contents. A narrative literature review was conducted on three studies that compared methanol, ethanol and water extracts of *Gracilaria tenuistipitata*, its agar extraction waste and *Gracilaria verrucosa*, supported by four solvent studies on other natural materials. Antioxidant activity was compared using IC₅₀ values in 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical-scavenging assays, and Pearson correlations were calculated from reported means. In *G. tenuistipitata*, the methanol extract showed the highest total phenolic content (68.20 mg GAE/g) and the strongest activity (DPPH IC₅₀ 2.59 mg/mL), followed by the ethanol and water extracts. The same order held for agar extraction sample, where the residue from hot-water extraction gave the most active methanol extract (DPPH IC₅₀ 0.33 mg/mL). In *G. verrucosa*, methanol and ethanol extracts did not differ significantly in either assay, but both were markedly more active than the hot-water extract. DPPH IC₅₀ correlated strongly and negatively with total phenolics ($r = -0.87$) and total flavonoids ($r = -0.94$). Antioxidants of red algae extract with polar organic solvents, particularly methanol and ethanol, therefore more effectively than water. Because the two alcohols have similar polarity and ethanol is safer for food and cosmetic use, a direct comparison under uniform conditions, followed by fractionation and isolation of the active compounds, is recommended.

Keywords: red algae; *Gracilaria*; extraction solvent; antioxidant

Conference scope: Pharmaceutical Sciences, Natural Products, and Health Innovation

Presentation type: ☐ Oral presentation ☒ Poster presentation ☐ Student presentation

BUDGETED ROBUST GOAL PROGRAMMING FOR VEHICLE ROUTING: ONE DUAL PER ROUTE AND A BUS RAPID TRANSIT CASE STUDY

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Abstract

Goal Programming (GP) is a technique employed to establish target levels for criteria such as the duration and distance of a route; however, the actual travel time on the route is seldom known exactly. This study seeks to create a Robust Goal Programming model for vehicle routing, wherein the travel time of each route is characterized by a budgeted uncertainty set, and the robust time goal of a route is determined by its worst-case travel time. The robust counterpart with a single budget dual for each route is formulated and demonstrated to be exact with a closed-form expression. It is demonstrated that attaching one dual to each arc transforms the budgeted set into a box set when the budget is no less than one, and that the price of robustness is bounded. A case study was performed on a 25-stop bus rapid transit network in Bogor. The findings indicate that the arc-by-arc dual coincides with the box set across all 54 goal-weight settings examined and overstates the goal objective by 12–23% at the base weights (1–27% across the weight grid), while the model employing a single dual per route progressively increases the protection as the budget grows. Two independent implementations yield identical values to within 10–6.

Keywords: Goal programming; Robust optimization; Vehicle routing; Budgeted uncertainty; Public transport

OPTICAL AND ELECTROCHEMICAL EVALUATION OF SOLVOTHERMALLY SYNTHESIZED NI-ASPARTATE BIO-MOF FOR HYDROGEN GAS PRODUCTION POTENTIAL

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Abstract

The global energy crisis and the urgent need for clean energy conversion technologies have stimulated the development of eco-friendly alternative photocatalytic materials. This study aims to synthesize a nickel-based Biological Metal-Organic Framework (Bio-MOF) using L-aspartic acid as an organic linker via a solvothermal method, as well as to evaluate its physicochemical characteristics, optical properties, and electrochemical behavior to determine its potential application in hydrogen gas production. The synthesis was carried out by reacting nickel salt and L-aspartic acid in a mixed solvent of distilled water and N,N-dimethylformamide (DMF) under elevated temperature conditions. Fourier Transform Infrared (FTIR) characterization confirmed the formation of coordination bonds through the disappearance of the free carboxylic acid absorption band (-COOH) and the emergence of asymmetric and symmetric stretching bands of the carboxylate ion (COO⁻) at 1547 cm⁻¹ and 1430 cm⁻¹, alongside the Ni-O vibration band at 506 cm⁻¹. X-Ray Diffraction (XRD) analysis revealed that the synthesized material possesses a crystalline structure with a crystallinity degree of 59.94% and an average crystallite size of 69.79 nm. Ultraviolet-Visible Diffuse Reflectance Spectroscopy (UV-Vis DRS) analysis yielded band gap energy values of 2.67 eV (indirect allowed) and 2.77 eV (direct allowed), proving that the material acts as a semiconductor active in the visible light spectrum. Electrochemical testing using Cyclic Voltammetry (CV) in an alkaline electrolyte demonstrated redox responses and a cathodic current increase of 0.78 mA at a potential of -1.00 V, in an alkaline electrolyte showed distinct redox responses and cathodic current increases, confirming charge transfer activity and the potential of active sites to support the water reduction reaction (Hydrogen Evolution Reaction). Overall, the solvothermally synthesized Ni-aspartate Bio-MOF exhibits promising physicochemical and optoelectrochemical properties as a viable photocatalyst candidate for solar-driven hydrogen gas production.

Keywords: Bio-MOF Ni-Aspartate, Hydrogen Production, Optical Properties, Solvothermal Synthesis.

THE EFFECT OF EXTRACTION METHODS ON TOTAL PHENOLIC CONTENT, ANTIOXIDANT ACTIVITY, AND α -AMYLASE INHIBITORY ACTIVITY OF CLOVE LEAF (*Syzygium aromaticum* L.) EXTRACTS

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Abstract

Background: Diabetes mellitus is a metabolic disorder associated with hyperglycemia and oxidative stress. Clove leaves (*Syzygium aromaticum* (L.) Merr. & L.M.Perry) are a potential source of bioactive compounds with antioxidant and α -amylase inhibitory activities. Extraction methods and solvents are important factors that may influence the phenolic content and biological activities of the resulting extracts.

Objective: This study aimed to evaluate the total phenolic content, antioxidant activity, and α -amylase inhibitory activity of clove leaf extracts obtained using eight extraction treatment combinations, compare conventional and modern extraction methods, and investigate the relationships among these parameters.

Methods: This experimental laboratory study employed three extraction procedures, namely maceration, infusion, and Ultrasonic-Assisted Extraction (UAE), comprising eight treatment combinations: maceration with 70% ethanol, maceration with 96% ethanol, maceration with n-hexane, aqueous infusion, UAE with 70% ethanol, UAE with 96% ethanol, UAE with n-hexane, and UAE with water. Total phenolic content was determined using the Folin-Ciocalteu method. Antioxidant activity was assessed using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, with vitamin C as the positive control, while α -amylase inhibitory activity was evaluated using an iodine-based colorimetric assay, with acarbose as the positive control. Antioxidant and enzyme inhibitory activities were expressed as IC₅₀ values. Descriptive statistics were used to summarize the data. Comparisons between conventional methods (maceration and infusion) and UAE were evaluated using paired-samples t-tests, while relationships among the study parameters were examined using Pearson's and Spearman's correlation analyses.

Results: The highest total phenolic content was obtained from the UAE n-hexane extract, at 166.211 ± 0.0274 mg GAE/g extract. The strongest antioxidant activity was observed in the aqueous infusion, with an IC₅₀ value of 8.718 ± 0.655 μ g/mL and a relative standard deviation (%RSD) of 7,51%. Meanwhile, the UAE 70% ethanol extract exhibited the strongest α -amylase inhibitory activity, with an IC₅₀ value of 57.325 ± 0.271 μ g/mL and a relative standard deviation (%RSD) of 0.472%. The paired-samples t-test indicated that UAE produced a significantly higher total phenolic content than the conventional methods (maceration and infusion; $p = 0.047$). Conversely, the conventional methods exhibited stronger antioxidant activity, as indicated by lower IC₅₀ values, with a statistically significant difference ($p = 0.027$). For α -amylase inhibition, UAE showed stronger activity descriptively than the conventional methods; however, the difference was not statistically significant ($p = 0.766$). Pearson's correlation analysis revealed positive but statistically nonsignificant relationships between total phenolic content and antioxidant IC₅₀ ($r = 0.629$, $p = 0.095$), total phenolic content and α -amylase IC₅₀ ($r = 0.487$, $p = 0.221$), and antioxidant IC₅₀ and α -amylase IC₅₀ ($r = 0.202$, $p = 0.631$).

Conclusion: The optimal extraction treatment varied according to the parameter evaluated. UAE with n-hexane yielded the highest total phenolic content (166.211 ± 0.0274 mg GAE/g extract), aqueous infusion exhibited the strongest antioxidant activity (IC₅₀ = 8.718 ± 0.655 μ g/mL), and UAE with 70% ethanol demonstrated the strongest α -amylase inhibitory activity (IC₅₀ = 57.325 ± 0.271 μ g/mL; %RSD = 0.472%).

Keywords: clove leaves, extraction methods, total phenolic content, antioxidant activity, α -amylase.

EVALUATION OF THE ANTI-INFLAMMATORY ACTIVITY OF MICROENCAPSULATED ETHANOLIC EXTRACT OF AFRICAN LEAF (*Vernonia amygdalina* Del.) IN A CARRAGEENAN-INDUCED RAT PAW EDEMA MODEL

Ahmad Dani¹

Abstract

Inflammation is a bodily defense response that, if excessive, requires regulation. African leaf (*Vernonia amygdalina* Del.) contains bioactive compounds, including flavonoids, which have the potential to inhibit the cyclooxygenase and lipoxygenase pathways. However, research on the in vivo anti-inflammatory activity of microencapsulated African leaf extract remains limited. This study aimed to evaluate the anti-inflammatory activity of microencapsulated ethanolic extract of African leaf in a carrageenan-induced rat paw edema model. This experimental study employed a completely randomized design with 25 male white rats divided into five groups: a negative control (0.5% CMC-Na), a positive control (sodium diclofenac at 63 mg/kg body weight), and three treatment groups receiving the microencapsulated extract at doses of 75, 100, and 150 mg/kg body weight. Edema was induced via subplantar injection of 1% carrageenan, and paw volume was measured using a plethysmometer over a period of 360 minutes. Data were analyzed using statistical tests, including the Games-Howell test. Phytochemical screening revealed the presence of alkaloids, tannins, flavonoids, steroids/triterpenoids, and saponins. The highest mean percentage of edema inhibition (59.64%) was observed at a dose of 150 mg/kg body weight, which is comparable to the 59.14% inhibition achieved by the positive control. All three doses demonstrated effectiveness that did not differ significantly from that of sodium diclofenac. Thus, microencapsulated ethanolic extract of African leaf shows potential as an anti-inflammatory agent in a rat paw edema model.

Keywords: African leaf, microencapsulation, anti-inflammatory, edema, carrageenan

APPLICATION OF K-MEANS CLUSTERING AND K-NEAREST NEIGHBORS FOR SURFACE COLOR DETERMINATION IN HIJAB FASHION RECOMMENDATIONS

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Abstract

Selecting hijab colors that suit an individual's skin tone can be challenging because people often rely on visual observation and personal preferences. Therefore, an application is needed to help identify skin color and recommend suitable hijab colors. This study uses K-Means Clustering to identify the dominant skin color (surface color) and K-Nearest Neighbors (KNN) to classify skin color into predefined categories.

This study aims to develop a web-based application that identifies facial surface color and provides hijab color recommendations. The data were obtained from the FairFace dataset by selecting facial images labeled as East Asian and Southeast Asian. The selection process resulted in 23,082 training images and 2,965 validation images. The research stages included image preprocessing using a Wiener filter, skin segmentation using YCbCr masking, dominant skin color extraction using K-Means Clustering, and classification using KNN based on Euclidean distance. The classification results were divided into four categories: Fair, Light Yellow, Medium Brown, and Dark. Model performance was evaluated using accuracy, precision, recall, F1-score, and a confusion matrix.

The results showed that the KNN model achieved an accuracy of 74% on an internal test set of 4,617 images and 72% on a validation set of 593 images. The model performed better in identifying the Dark category, while the Fair and Light Yellow categories remained more difficult to classify accurately. This study resulted in a Streamlit-based web application that displays skin color identification results and provides hijab color recommendations based on the predicted skin tone category. The application is expected to help users choose hijab colors more easily based on their skin tone.

Keywords: Surface Color, K-Means Clustering, K-Nearest Neighbors, FairFace, Hijab Colors.

ANTIOXIDANT ACTIVITY AND CHOLESTEROL INHIBITION OF EXTRACTS OF FRESH KETAPANG LEAVES (*TERMINALIA CATAPPA* L.)

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Abstract

Ketapang leaves (*Terminalia catappa* L.) are known to contain phenolic compounds with potential antioxidant and cholesterol-inhibiting activities. This study aimed to determine the moisture content, yield, total phenolic and flavonoid contents, antioxidant activity, and cholesterol inhibitory activity of fresh ketapang leaf extracts. Extraction was carried out using acetone and methanol as solvents. Total phenolic content (TPC) was determined by the Folin- Ciocalteu method and total flavonoid content (TFC) by the AlCl₃ method. Antioxidant activity was assessed using the DPPH method and expressed as IC₅₀. Cholesterol inhibition was tested using the Liebermann-Burchard method and expressed as EC₅₀, with simvastatin as the reference drug. The moisture content of the fresh leaves was $9.94 \pm 0.05\%$. The yields of the acetone and methanol extracts were $6.78 \pm 0.71\%$ and $6.11 \pm 0.68\%$, respectively. The acetone extract had a higher TPC (420.24 ± 18.71 mg GAE/g) than the methanol extract (367.12 ± 11.03 mg GAE/g). In contrast, the TFC of the methanol extract (51.25 ± 2.08 mg QE/g) was higher than that of the acetone extract (42.07 ± 3.67 mg QE/g). Both extracts were classified as very strong antioxidants, with IC₅₀ values of 10.47 ± 0.42 ppm (acetone) and 9.26 ± 0.18 ppm (methanol). The cholesterol inhibitory activity of the acetone extract (EC₅₀ 395.49 ± 13.48 mg/L) was slightly stronger than that of the methanol extract (452.75 ± 9.65 mg/L); the reference drug simvastatin had an EC₅₀ of 40.66 ± 2.89 mg/L. These results indicate that fresh ketapang leaves have potential as a natural source of both antioxidants and cholesterol inhibitors.

Keywords: *Terminalia catappa* L., fresh leaves, antioxidant, DPPH, cholesterol inhibition, Liebermann-Burchard

DEVELOPMENT OF AN INTEGRATED CORRESPONDENCE AND DOCUMENT MANAGEMENT SYSTEM WITH RSA-BASED DIGITAL SIGNATURE FOR PRIMARY HEALTHCARE ADMINISTRATION

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Abstract

The management of clinic correspondence and supporting documents requires consistent formats, controlled authority, and traceable user actions. This study develops and technically validates TTE RSA Hanania, an integrated correspondence and document management system for Klinik Pratama Rumah Hanania. The development used an iterative approach encompassing requirement analysis, architecture and data- model design, implementation, and technical validation. The system uses React for the frontend, FastAPI for backend services, MongoDB for structured data, and local file storage for generated documents and attachments. Its functional scope includes 26 structured templates, automatic numbering, versioning, approval, sequential signing, delegation, archiving, notifications, reports, audit logs, PDF generation, and uploaded-PDF processing. An internal signature mechanism canonicalizes a structured payload, calculates a SHA-256 digest, and uses RSA- 2048 keys; private keys are protected using Fernet encryption. Technical release evidence records 48 passing unit tests for backend, PDF, and template components, 32 passing end-to-end API tests, successful rendering of 26 templates, frontend build completion, and successful backend and MongoDB health checks. The results support the operation of core functions in the documented test environment. However, they do not establish user acceptance, operational efficiency, comprehensive security, standard PDF signature compliance, or certified electronic- signature status. This article contributes an integrated workflow and traceability design for primary-clinic documents, while explicitly identifying the controls and field evaluations still required before routine operational use.

Keywords Clinic correspondence, Document management, RSA digital signature, SHA-256, Audit trail, Role based access control, FastAPI and MongoDB

WEB-BASED INTEGRATED INFORMATION SYSTEM FOR PRODUCTION, SALES, INVENTORY, AND STAFF MANAGEMENT OF A MULTI-OUTLET BABY PORRIDGE BUSINESS

Rendi Nur Rizqi¹

Abstract

PT Rumah Hanania Sejahtera produced and sold baby porridge through six outlets in Bogor, Indonesia, while customer orders were received through WhatsApp and recorded manually. Production, sales, inventory, and staff data were kept in separate records, which caused input errors, recurring cash discrepancies, and slow cross-outlet reporting. This study developed a web-based information system that integrated production scheduling, pre-order and point-of-sale transactions, raw material inventory, and outlet staff access in a single database. Its contribution was an integrated design for a small multi-outlet food producer in which a weekly menu rotation and per-outlet daily stock quotas linked production directly to cashier sales, supported by a member loyalty module. The system was built with the Waterfall model using Laravel 11 and MySQL, with role-based access for the owner, administrator, cashiers, and members. Functional quality was assessed through 23 black-box scenarios designed with equivalence partitioning, usability was measured with the System Usability Scale (SUS) from ten users, and six operational indicators were compared before and after deployment. Initial testing passed 21 of 23 scenarios (91.30%); the two defects, in role-based redirection and point deduction, were fixed and all scenarios passed on retest. The mean SUS score was 81.75 (SD 4.09), above the commonly used benchmark of 68. The usability items averaged 97.81, whereas the learnability items averaged 17.50, indicating that users judged the system effective but still relied on initial assistance. Recapitulation of about 100 daily orders fell from 20 minutes to 10 seconds, cross-outlet revenue recapitulation from 60 minutes to 1 minute, and stock recapitulation from 20 to 5 minutes. No cash discrepancy or order input error was reported during the first ten days of use. The integrated system improved the speed and accuracy of daily operations, although structured onboarding remained necessary.

FLAVONOID CONTENT AND ANTIOXIDANT ACTIVITY OF COOKIES MADE FROM JACK BEAN FLOUR (*CANAVALIA ENSIFORMIS*) AND MODIFIED CASSAVA FLOUR (MOCAF)

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Abstract

Jack bean contains flavonoids like isoflavones, which act as antioxidants by neutralizing oxidative imbalance. Its high protein and fiber content makes it a promising ingredient for cookies, especially when combined with Mocaf flour—a fermented cassava flour similar to wheat flour. This combination is ideal for those maintaining a healthy diet or following specific nutritional plans (vegetarian diet). This study focuses on the development of soft cookies with varying substitution ratios of jack bean flour and Mocaf flour: F1 (75:25), F2 (50:50), F3 (25:75), and P1 (100:0), P2 (0:100). The objective is to determine the optimal cookie formula that meets Indonesian National Standards (SNI), exhibits the highest flavonoid content and antioxidant activity, and is most preferred by panelists. A Completely Randomized Design (CRD) was employed in this experimental study. The analyses conducted include proximate composition, dietary fiber content, flavonoid levels, antioxidant activity, and sensory acceptance (hedonic test). The best results were obtained from formula F1 (75:25), which contained 9.67% protein, 29.40% fat, 47.91% carbohydrates, 13.00% dietary fiber, 12.66% moisture, and 1.36% ash. Flavonoid analysis yielded 13.16 mg QE/g, while antioxidant activity (IC₅₀) reached 218.66 ppm, classified as very weak. Sensory evaluation revealed that F1 was the most preferred formula, with an average hedonic score of 16.78, indicating significant effects of formula variation on cookie color, aroma, taste, and texture. This study highlights the potential of jack bean flour and Mocaf flour as functional ingredients in soft cookies, offering nutritional benefits and acceptable sensory properties. Future research is recommended to include additional ingredients to enhance the nutritional value and antioxidant activity of cookies.

Keywords: antioxidant activity, cookies, flavonoid, jack bean, mocaf

ANALYSIS OF OPTIMAL PORTFOLIO FORMATION FOR LQ45 STOCKS: A STANDARD MARKOWITZ AND SINGLE INDEX MODEL APPROACH

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Abstract

A stock portfolio is a combination of two or more securities invested over a specific period and under certain conditions. The objective is to maximize expected returns while minimizing the risk of loss through asset allocation (diversification) in accordance with financial targets and risk profiles. This study analyzes and compares portfolio optimization using the Markowitz Model and the Single Index Model (SIM), assuming an annual risk-free rate of 6%. The analyzed data comprises the daily closing prices of LQ45 stocks for the period from January 2025 to June 2026. Based on historical daily data, the overall Markowitz model projects an annual expected return of 552.29%, a volatility of 71.10%, and an optimal Sharpe Ratio of 7.68. Conversely, the overall SIM yields a comparable expected return of 553.17%, but with higher volatility (101.38%) and a lower Sharpe Ratio (5.40). For the five best-performing stocks, the optimal Markowitz portfolio allocates weights to HRTA (22.76%), MAPI (21.24%), ICBP (19.22%), BBKA (18.48%), and ANTAM (18.29%), resulting in an expected return of 532.49%, a volatility of 135.10%, and a Sharpe Ratio of 3.90. Meanwhile, the portfolio using the Single Index Model, with allocated weights to ICBP (20.21%), BBKA (19.88%), ANTAM (19.68%), MAPI (19.24%), and ADRO (19.16%), yields an expected return of 549.78%, a volatility of 156.26%, and a Sharpe Ratio of 3.48. This study shows that both the Markowitz Model and the Single Index Model (SIM) efficiently optimize the LQ45 stock portfolio, albeit for different risk profiles. Risk-averse investors benefit more from the Markowitz Model due to its optimal diversification and risk mitigation. Conversely, risk-tolerant investors may employ the Single Index Model to achieve comparable returns through a concentrated selection of market-leading assets. Overall, the Markowitz Model provides the most efficient capital allocation in the Indonesian capital market.

Keywords: Diversification; LQ45 Stock Portfolio; Markowitz Model; Portfolio Optimization; Single Index Model

Conference scope: Mathematics, Statistics, and Computational Modeling

Presentation type: Oral presentation

CHARACTERIZATION OF PHENOLIC COMPOUNDS AND EVALUATION OF ANTIOXIDANT AND ANTICHOLESTEROL ACTIVITIES OF KETAPANG (TERMINALIA CATAPPA L.) LEAVES

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Abstract

Hypercholesterolemia is a major risk factor for cardiovascular diseases, including atherosclerosis and coronary heart disease. The use of statins to lower cholesterol levels has encouraged research into natural products as alternative sources of bioactive compounds. Ketapang (*Terminalia catappa* L.) is known to contain various phenolic compounds, including corilagin, punicalagin, quercetin, kaempferol, luteolin, ellagic acid, and gallic acid, which may possess antioxidant and anticholesterol activities. This study aims to characterize the phenolic compounds in *T. catappa* leaves and evaluate their antioxidant and anticholesterol activities. Compound characterization will provide information on the phenolic compounds present in the samples. Antioxidant activity will be evaluated using the DPPH method based on the ability of the samples to scavenge free radicals, while anticholesterol activity will be assessed using the Liebermann–Burchard method to evaluate changes in cholesterol levels based on absorbance measurements. This study is expected to provide scientific information on the characteristics of phenolic compounds and the antioxidant and anticholesterol potential of *T. catappa* leaves. The findings are also expected to serve as a foundation for further research into the use of ketapang leaves as a natural source of bioactive compounds.

Keywords: anticholesterol, antioxidant, phenolic compounds, *Terminalia catappa*.

POTENTIAL OF LIMONOIDS FROM KI BAWANG STEM BARK (DYSOXYLUM ALLIACEUM) AS CHEMOPREVENTIVE AGENTS AGAINST MCF-7 CELLS: IN VITRO AND IN SILICO APPROACH.

Rifqi Fajar Pratama¹

Abstract

Breast cancer remains a major health concern in Indonesia, highlighting the need to explore new anticancer candidates from natural products. This study investigated limonoids from the stem bark of *Dysoxylum alliaceum* (Meliaceae) for their potential as chemopreventive agents against MCF-7 human breast cancer cells. The research involved plant identification, ethanol maceration, partitioning with n-hexane, and compound isolation through vacuum liquid chromatography and column chromatography. The isolated compound was characterized using FTIR, LC-MS/MS-QTOF, and ¹H- and ¹³C-NMR spectroscopy. Its cytotoxic activity was evaluated in vitro using the resazurin assay, while molecular docking was performed to assess its interaction with estrogen receptor alpha (ER- α). The isolated compound was identified as 6 α -acetoxygedunin and exhibited cytotoxic activity against MCF-7 cells, with an IC₅₀ value of 11.84 μ g/mL. Molecular docking yielded a binding affinity of -10.4 kcal/mol for 6 α -acetoxygedunin against ER- α , compared with -9.97 kcal/mol for hydroxy-tamoxifen. These findings indicate that 6 α -acetoxygedunin is a promising natural product for further investigation as an anticancer candidate. Further experimental studies are required to validate its molecular mechanism and biological selectivity.

IMPLEMENTASI ARTIFICIAL NEURAL NETWORK UNTUK DETEKSI KEBAKARAN PADA INDUSTRI PEMOTONGAN KAYU BERBASIS *INTERNET OF THINGS*

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Abstract

Wood processing industries face high fire risk due to accumulated biomass waste such as sawdust, which can undergo smoldering before developing into open flames. This study implements an Internet of Things (IoT)-based early fire detection system using an Artificial Neural Network (ANN) to classify fire risk levels. The system uses an ESP32 NodeMCU, an AMG8833 infrared thermal sensor, and an MQ-2 gas sensor, producing 65 features processed by a 65-32-16-3 Multilayer Perceptron (MLP) on a Flask server. Environmental conditions are classified as Safe (23.0°C–33.5°C), Alert (34.0°C–59.5°C), and Danger (>60.0°C). The model achieved 96.38% accuracy and a macro F1-score of 0.9667 on 138 test samples. A buzzer and web dashboard delivered real-time warnings, including during fail-safe testing. Integrating IoT and ANN has the potential to support early fire warning in wood-cutting industries.

Keywords: early fire detection, Internet of Things, AMG8833 thermal sensor, MQ-2 gas sensor, Artificial Neural Network.

AN OPEN GEOSPATIAL WORKFLOW FOR HAZARD-AWARE CROP PLANNING IN A VOLCANIC UPLAND VILLAGE OF KEDIRI, INDONESIA

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Abstract

Greening programmes on Java's volcanic foothills often select crops without knowing where each crop fits or where slopes are unstable. We developed a repeatable Google Earth Engine workflow for Kalipang village, Kediri, East Java (695 ha, 30 m grid). It evaluates fourteen crops against the Indonesian land evaluation criteria, delineates planting zones from slope rules and a landslide susceptibility index, and estimates the dry-season water deficit. Slope was the dominant limiting factor, setting the actual class on 84–97% of the area for eleven crops. Zoning allocated 121.8 ha to annual crops, 180.2 ha to tree crops and 273.5 ha to permanent vegetation. Under a conditional management scenario with terracing and liming, chilli and shallot could become highly suitable on the gentlest land, and clove, avocado and durian moderately suitable across most of the tree-crop zone. The results were robust. Replacing the global soil product altered the classes on no more than 1% of the area. Removing slope from the susceptibility index left 99.4% of the zoning unchanged, and 200 Monte Carlo weight sets preserved a median 98.1% of zone assignments. A climatic deficit of about 375 mm from June to October defines the scale of water storage needed. The workflow offers low-cost, screening-level guidance that other upland villages can replicate, pending field soil sampling and landslide inventory.

Keywords: land suitability; landslide susceptibility; Google Earth Engine; sensitivity analysis; volcanic upland

Topic: Biodiversity and Environmental Sustainability

Presentation type: Oral

AN ADAPTIVE REUSE DECISION FRAMEWORK FOR CONVERTING UNDERUTILISED GOVERNMENT QUARTERS INTO INTERIM RENTAL HOUSING FOR URBAN CIVIL SERVANTS IN MALAYSIA

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Abstract

Underutilised government quarters offer a potential accommodation resource for urban civil servants in Malaysia but vacancy alone does not establish suitability for interim rental housing. Conversion requires consideration of housing need, building capability, affordable and public asset governance. This paper proposes a preliminary conceptual adaptive reuse decision framework for screening and prioritizing government quarters for this purpose. A purposive narrative synthesis connects Malaysian evidence on rental pressures, quarters management and reuse factors with wider housing and adaptive reuse decision literature. The proposed framework comprises seven stages which are asset identification, demand and location screening mandatory eligibility assessment, comparative suitability appraisal, delivery-model selection, pilot commissioning and monitoring with an exit review. It separates essential conditions for authorized and safe occupation from criteria used to compare feasible alternatives. Six appraisal domains address physical adaptability, housing need and location, whole-life financial viability, regulatory and institutional readiness, environmental performance and social suitability. Numerical weights and decision thresholds are not prescribed because they requirements, asset capabilities and operating responsibilities while allowing retention of the original use or exclusion from conversion where appropriate. No primary data were collected and the framework has not been empirically validated. Expert consultation and application to selected urban quarter cases are proposed to refine the criteria and decision pathways. The framework provides a structured basis for subsequent validation and transparent public asset decisions without assuming that adaptive reuse will necessarily reduce government expenditure.

Keywords: adaptive reuse; government quarters; interim rental housing; civil servants; decision framework

FACILITY LAYOUT ARRANGEMENT OF COMMUNITY FACTORY PRODUCING CHICKEN FEED USING SYSTEMATIC LAYOUT PLANNING

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Abstract

This paper was introduced conceptual community micro factory that towards the systematic modern approach of factory. Generally, the broiler feed and pellet production industry are vital to the poultry sector, ensuring balanced nutrition for rapid, healthy flock growth. The community factory operates an integrated agricultural business in small district encompassing crop cultivation, broiler chicken meat production, and a small-scale feed manufacturing facility. Although the feed pellet mill has been constructed and equipped with the necessary machinery, the production floor currently suffers from an unorganized and dispersed machine layout. In order to resolve these operational inefficiencies, this study applies the Systematic Layout Planning (SLP) methodology to optimize spatial utilization, reduce material handling costs, increase overall productivity, and ensure strict compliance with hygienic standards. Through comprehensive analyses of input data, material flows, and activity-relationship diagrams, multiple layout alternatives were developed and systematically evaluated. Among the proposed designs, design 3 was identified as the optimal layout solution for the facility. Finally, targeted recommendations for future operational enhancements and facility upgrades are presented.

Keywords: Community Micro Factory, Systematic layout planning, Community empowerment

Conference scope: Science Education, STEM, and Community Empowerment

Presentation type: Poster presentation

ANALYSIS OF CONSUMER SATISFACTION WITH SERVICE QUALITY USING THE CUSTOMER SATISFACTION INDEX (CSI) METHOD AT HANKAM RAYA PHARMACY CISARUA BOGOR

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Abstract

Consumer satisfaction is a crucial indicator of pharmaceutical service quality. Compromised service quality can erode consumer trust and loyalty, subsequently leading to a decline in revenue. This study aimed to describe consumers' sociodemographic characteristics, analyze service quality, and measure overall consumer satisfaction using the Customer Satisfaction Index (CSI) at Apotek Hankam Raya Bogor. Employing a descriptive quantitative design with a crosssectional approach, the study collected data via questionnaires from 95 eligible consumers between February and April 2026. The instrument comprised 20 service attributes categorized into the five SERVQUAL dimensions. Instrument quality was assessed using the product-moment validity test and Cronbach's Alpha reliability test. CSI analysis involved calculating the Mean Importance Score (MIS), Mean Satisfaction Score (MSS), Weighting Factor (WF), Weight Score (WS), and Total Weight (WT). The majority of respondents were aged 36–45 (32.6%), female (62.1%), highly educated (62.1%), and private-sector employees (26.3%). Scores for all five service quality dimensions exceeded 90%; "assurance" recorded the highest score (95.64%), while "empathy" recorded the lowest (93.73%). The overall CSI score was 80.52%, placing satisfaction in the "satisfied" category. The findings indicate that, overall, the pharmacy's services met consumer expectations; however, periodic improvements remain relevant, particularly regarding comfort, the provision of medication information, and service responsiveness.

Keywords : Pharmacy; service quality; Customer Satisfaction Index.

DEVELOPMENT OF A COMBINATION TRANSDERMAL PATCH OF CENTELLA ASIATICA HERB EXTRACT AND MORINGA OLEIFERA LEAF EXTRACT WITH VARIATIONS IN EUDRAGIT E100 POLYMER CONCENTRATION

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Abstract

Dementia is a progressive neurodegenerative disorder characterized by progressive cognitive decline and increasing need for sustained pharmacological management. Transdermal drug delivery offers a potential strategy to maintain controlled release and support treatment adherence. This study aimed to develop combination transdermal patches containing Centella asiatica herb extract and Moringa oleifera leaf extract, both recognized for their neuroprotective potential, and to evaluate the influence of Eudragit E100 concentration on patch characteristics and flavonoid release. Three formulas were prepared by the solvent casting technique using HPMC E5 and Eudragit E100 at ratios of 10:2, 10:3, and 10:4. The formulations were assessed for organoleptic properties, pH, weight variation, thickness, folding endurance, flavonoid and asiaticoside content, as well as in vitro release behavior using Franz diffusion cells. All formulas demonstrated acceptable physical characteristics, with pH values of 6.005-6.216, weight uniformity (1.055-1.191 g), thicknesses (0.19-0.23 cm), and folding endurance (358-573). Significant differences were observed among the formulas ($p < 0.05$). A higher proportion of E100 was associated with slower flavonoid release rate. Formula 2 (HPMC E5 : Eudragit E100, 10:3) was identified as the optimum formulation because it provided more controlled flavonoid release while maintaining satisfactory physical quality, this difference was statistically significant ($p = 0.001$).

Key Word: Centella asiatica, Moringa oleifera, Transdermal, Patch

EVALUATION OF ETLINGERA ELATIOR USING AN UNTARGETED METABOLOMIC FINGERPRINTING, FLAVANOID CONTENT, AND ANTIBACTERIAL ACTIVITY APPROACH BASED ON DIFFERENCES IN PLANT PARTS AND EXTRACTION METHODS

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Abstract

Etlingera elatior is a plant native to Indonesia that has long been utilized by the community for both culinary and medicinal purposes. The efficacy of this plant is determined by its chemical metabolite content, in terms of both quantity and quality. Various factors influence the chemical metabolite composition, including the specific plant part used and the extraction method employed; therefore, standardizing these factors is essential. The research process included sampling, plant identification, preparation of simplisia (dried plant material), determination of moisture content, and extraction via maceration and ultrasound-assisted extraction (UAE). The resulting extracts were evaluated for total flavonoid content (TFC) and antibacterial activity, and subjected to fingerprint analysis using Fourier Transform Infrared (FTIR) spectroscopy. The FTIR data were processed using chemometric techniques, specifically multivariate Principal Component Analysis (PCA). The results indicate that the moisture content of the simplisia ranged from 3.55% to 4.60%. Leaf extracts exhibited the highest yield, flavonoid content, and antibacterial activity. FTIR spectra revealed that extracts from the stems, leaves, and flowers—obtained via either maceration or UAE—shared similar functional group characteristics but differed within the "fingerprint" region. PCA of the FTIR spectra successfully differentiated and grouped the samples based on their respective plant parts, with PC1 and PC2 accounting for 92.0% (for maceration) and 80.6% (for UAE) of the variance.

Keywords: *Etlingera elatior*, maceration, UAE, FTIR, phenolics, flavonoids, antibacterial.

DESIGN AND DEVELOPMENT OF AN IOT-BASED EARLY WARNING SYSTEM (EWS) USING THE TSUKAMOTO FUZZY METHOD IN THE PELABUHAN RATU COASTAL AREA

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Abstract

Coastal areas are vulnerable to tsunami hazards that may cause significant damage and loss of life. Pelabuhan Ratu, Sukabumi, West Java, requires an effective monitoring system to support local disaster mitigation. An early warning system capable of monitoring environmental changes and delivering timely information is therefore needed. This study aims to design and implement an Internet of Things (IoT)-based tsunami Early Warning System (EWS) using the Tsukamoto Fuzzy method. The system is designed to monitor water level, ground movement, and rainfall intensity in real time, classify environmental conditions into warning levels, and provide accessible monitoring information through a website. A hardware development method was employed, involving system design, implementation, integration, and testing. The system uses an ESP32 DevKit V1 microcontroller, JSN-SR04T ultrasonic sensor, MPU6050 sensor, and YL-83 rain sensor. A 10 WP solar panel, battery, and power management components provide an independent power supply. Sensor data are processed using the Tsukamoto Fuzzy method to determine three warning levels: Safe, Alert, and Danger. The test results showed that the system successfully integrated environmental monitoring, fuzzy-based decision-making, local warning indicators, and website monitoring. The Tsukamoto Fuzzy method achieved 100% accuracy in the conducted classification verification tests, while data transmission to the website recorded an average delay of 0.84 seconds and a 100% transmission success rate at five-second intervals. These results indicate that the prototype can support real-time environmental monitoring and local tsunami mitigation. Further testing under diverse environmental conditions is recommended to assess its reliability in broader applications.

Keywords: Early Warning System, Internet of Things, Tsukamoto Fuzzy, Tsunami, Solar Panel.

OPERATIONALIZING CONSTITUTIONAL ETHICS TO ELIMINATE REGULATORY LAG IN GREEN TECHNOLOGY TRANSITIONS

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Abstract

The rapid global transition toward green technology and carbon market mechanisms in Indonesia— governed by Presidential Regulation No. 98/2021 and its successor Presidential Regulation No. 110/2025—frequently encounters severe regulatory lag (keterlambatan regulasi) and legislative inertia. This regulatory gap leaves carbon governance vulnerable to market-driven greenwashing, rent-seeking behavior, and the marginalization of customary (adat) land rights. To resolve this systemic pathology, this study operationalizes E. T. Hadi Saputra's Constitutional Ethics framework as a guiding paradigm for legal reconstruction. By filtering carbon governance through the Prisma Pancasila and the core mandates of the 1945 Constitution—specifically Article 28H(1) guaranteeing a healthy environment and Article 33 commanding state-controlled public welfare—this paper formulates a tri-fold evaluation model: the Humanitarian and Justice Test, the Public Welfare Test, and the Living Law Test. The findings indicate that overcoming regulatory lag requires replacing rigid legal formalisms with an agile, ethical framework that embeds Free, Prior, and Informed Consent (FPIC) for indigenous communities while establishing transparent Measurement, Reporting, and Verification (MRV) systems. Ultimately, operationalizing Constitutional Ethics ensures that green technology transitions do not degenerate into commercialized land grabbing, but rather serve as an instrument of authentic ecological justice and national sovereignty.

Keywords: Constitutional Ethics, Regulatory Lag, Green Technology Transitions, Carbon Governance, Ecological Justice, Prisma Pancasila.

COMPARATIVE POTENCY AND INTERACTIONS OF ORTHOSIPHON-BASED HERBAL COMBINATIONS ON ANTIDIABETIC, ANTIOXIDANT, AND ANTI-INFLAMMATORY ACTIVITIES

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Abstract

Background: Hyperglycemia and oxidative stress are important processes in diabetes. Inhibition of α -glucosidase may help reduce carbohydrate digestion and postprandial glucose absorption, while antioxidant activity may help counter oxidative stress. This study evaluated the biological activities of four medicinal plants and examined whether their combinations showed improved activity relevant to diabetes. This study aimed to evaluate the biological activities and preliminary toxicity of four medicinal plants extracted using different ethanol concentrations and to investigate the interactions of selected extract combinations. **Methods:** Extracts of *Orthosiphon aristatus* (kumis kucing), *Cosmos caudatus* (kenikir), *Apium graveolens* (celery), and *Sonchus arvensis* (tempuyung) were prepared by maceration using 40%, 55%, and 70% ethanol at a plant-to-solvent ratio of 1:10. Individual extracts were screened for antioxidant activity using the DPPH assay, protein-denaturation inhibition, and preliminary toxicity using the brine shrimp lethality test (BSLT). Four extracts were selected based on the screening results and combined into five formulations (F1–F5). The combinations were evaluated for antioxidant activity, α -glucosidase inhibition, and preliminary toxicity. Interactions were assessed using the fractional inhibitory concentration index (FICI). **Results:** Among the individual extracts, *C. caudatus* extracted with 40% ethanol (KN40) showed the strongest antioxidant activity ($IC_{50} = 6.81$ mg/L) and the highest BSLT LC_{50} (938.13 mg/L). *C. caudatus* extracted with 70% ethanol (KN70) showed the strongest protein-denaturation inhibitory activity ($IC_{50} = 4,218.36$ mg/L). Among the combinations, F2 (2:1:1:1) showed the strongest antioxidant activity ($IC_{50} = 10.76$ ppm), whereas F3 (1:2:1:1) showed the strongest α -glucosidase inhibitory activity ($IC_{50} = 2,132.74$ ppm). F1 had the highest BSLT LC_{50} among the combinations (524.33 ppm). FICI analysis indicated additive interactions for F2 in the antioxidant assay and for F1, F3, F4, and F5 in the α -glucosidase inhibition assay. All combinations showed indifferent interactions in the BSLT assay. **Conclusion:** The extracts exhibited distinct and complementary biological profiles involving antioxidant, anti-inflammatory, and α -glucosidase inhibitory activities. The findings support a multidimensional approach to selecting botanical combinations, in which the optimal formulation is determined not by maximal activity in a single assay but by the overall balance among multiple relevant biological activities and preliminary toxicity. This approach provides a rational basis for further in vivo evaluation of selected extract combinations for their potential in diabetic nephropathy management.

Keywords: *Orthosiphon aristatus*; herbal combinations; α -glucosidase inhibition; antioxidant activity; anti-inflammatory activity.

ISOLATION AND BIO-MOLECULAR CHARACTERIZATION THRU 16S RRNA AND NOSZ FUNCTIONAL GENE SEQUENCING ANALYSIS OF DIAZOTROPHIC MICROORGANISMS FROM PADDY SOILAND ITS UTILIZATION AS BIOFERTILIZER FOR REDUCED SYNTHETIC FERTILIZER APPLICATION ON RICE

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Abstract

Using molecular techniques of Polymerase Chain Reaction (PCR) and sequence analysis of 16S rRNA gene and functional gene detection of nosZ gene, this study isolated three new rhizobacteria collected from paddy rice area in General Mamerto Natividad, Nueva Ecija. The three new isolates (GMN-1, GMN-2, GMN-5) possess N-fixation and P-solubilization abilities and are compatible with local reference strains. The preliminary laboratory trial conducted at the University of Miyazaki, Japan showed GMN-2's superiority over the two other new isolates. Thus, this was verified on mesocosm experiment wherein it used integrated nutrient management combining 50% and 75% reduced synthetic fertilizer with the developed biofertilizer and applied on rice (NSIC-Rc 222): T1 – full recommended rate of inorganic fertilizer (RRIF); T2 – ½ RRIF + supriMO; T3 – ½ RRIF + GMN-2, NE1-19, NE1-65; T4 – ¼ RRIF + supriMO; T5 ¼RRIF + GMN-2, NE1-19, NE1-65. The phylogenetic analysis indicated that the three new isolates were 100% similar in nucleotide identity via the 16S rRNA gene with Pseudarthrobacter species, an organisms with plant growth promoting abilities and has inherent functional genes to thrive against extreme agro-environmental gradients. More so, this genus is not host-specific and can be used for various crops across a variety of soil types and environment, thus indicating its multi-crop and multi-location utilization potential. The highlights of the results correlating the influence of the treatments and its interrelationship with crop parameters indicated that combining biofertilizer and inoculants with reduced amount of synthetic fertilizer is a viable and feasible strategy that can be adopted with the arising concern for soil health.

Keywords: rhizobacteria; biofertilizer; nitrogen-use efficiency; paddy rice soil; nutrient management

Conference scope: Food Science, Agriculture, and Natural Resources

INOCULATION TEST OF REPRESENTATIVE DENITRIFYING BACTERIA ISOLATED FROM SELECTED PADDY RICE AREAS IN NUEVA ECIJA AND PANGASINAN, PHILIPPINES ON RICE (ORYZA SATIVA L. RC222)

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Abstract

The study evaluated the effects of representative bacterial consortia isolated from selected paddy rice fields in Nueva Ecija and Pangasinan on rice (*Oryza sativa* L. NSIC Rc222) under continuous flooding and alternate wetting and drying (AWD) conditions. A randomized complete block design with two factors, water management and bacterial inoculation, was established in a mesocosm experiment to determine microbial establishment, soil nitrogen dynamics, plant nitrogen uptake, growth, and yield. The introduced bacterial consortia successfully colonized the rhizosphere, although their persistence varied with water regime and isolate origin. Continuous flooding favored the highest microbial population and plant nitrogen uptake, particularly in Guimba consortium, suggesting enhanced biological nitrogen fixation and improved nitrogen availability. In contrast, AWD promoted alternating aerobic and anaerobic soil conditions that stimulated nitrification during drying periods and denitrification following re-flooding, increasing the potential for nitrogen losses through gaseous emissions. Despite minimal changes in residual soil total nitrogen, inoculated treatments improved plant nitrogen uptake, indicating more efficient nitrogen transformation rather than increased nitrogen accumulation in the soil. The integration of microbial inoculation with appropriate water management enhanced nitrogen-use efficiency by regulating the balance among biological nitrogen fixation, nitrification, and denitrification. These improvements resulted into increased plant growth, higher biomass production, and increased in grain yield compared with uninoculated controls. The findings demonstrate that locally isolated bacterial inoculants have potential as biofertilizers for sustainable rice production by improving microbial nitrogen cycling, reducing nitrogen losses, and enhancing crop productivity.

Keywords: denitrification; nitrification; nitrogen-use efficiency; paddy rice soil; water management

Conference scope: Food Science, Agriculture, and Natural Resources



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