



E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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PTDI, UiTM Cawangan Johor
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ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang
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A-ST128: ECOBIOCREAM: EXPLORING THE ANTIMICROBIAL SYNERGISM BETWEEN GELENGGANG LEAVES AND RED DRAGON FRUIT PEEL EXTRACTS IN A NOVEL ANTISEPTIC CREAM

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ABSTRACT

This study focuses on developing a sustainable antiseptic cream by combining extracts from gelenggang leaves and red dragon fruit peel. The cream offers an alternative therapy to address the high cost of conventional drugs in developing countries and the rising issue of antimicrobial resistance, particularly against microorganisms like methicillin-resistant *Staphylococcus aureus* (MRSA). Gelenggang leaves, traditionally used for skin ailments, and red dragon fruit peel, a commonly discarded waste rich in bioactive compounds, are repurposed to create an eco-friendly, plant-based solution. Antimicrobial susceptibility testing revealed significant activity against Gram-positive bacteria and fungi, including MRSA and *Candida albicans*, though it showed limited efficacy against Gram-negative bacteria. This highlights the potential of plant extracts in combating antimicrobial resistance. The cream is practical, suitable for all skin types, and integrates effortlessly into daily skincare routines. Its reliance on repurposed fruit waste supports the United Nations Sustainable Development Goals (SDGs) by reducing environmental impact and promoting waste reduction. Beyond antiseptic properties, the cream offers multifunctional benefits such as wound healing and anti-inflammatory effects. By presenting a safe, natural alternative to conventional antiseptics, the cream exemplifies innovative skincare that tackles health and environmental challenges while promoting responsible consumption and sustainability.

Keywords: Gelenggang Leaves, Red Dragon Fruit Peel, Antimicrobial Resistance, Topical Antiseptic Cream, Fruit Waste Valorisation

1. Product Description

This topical antiseptic cream combines extracts from gelenggang leaves and red dragon fruit peel, providing an eco-friendly and effective solution for skin infections. The extracts were then screened for bioactive compounds (**Table 1**) present to hypothesise the compounds responsible for antimicrobial properties. The gelenggang leaves extract and the dragon fruit peel extract are rich in antioxidants, and their antioxidant content is listed in **Table 2**. Both extracts have potent antibacterial and antifungal properties towards various pathogenic microorganisms on the skin. Together, they combat infections, promote healing, and reduce

inflammation, particularly against drug-resistant pathogens like MRSA and *C. albicans*. The extracts showed potent activity against Gram-positive bacteria and fungi, with the highest efficacy against MRSA. However, they were ineffective against Gram-negative bacteria due to structural and biochemical differences (**Table 3** and **Table 4**). The cream (**Figure 1**) is practical and versatile, offering a natural remedy for common skin infections, minor cuts, and irritation. It provides quick relief, prevents infection, and nourishes the skin, fitting seamlessly into daily routines with its easy application. The formulation was evaluated from various parameters (**Table 5**) to ensure it meets quality standards. The toxicity of the extracts and formulation were assessed through the brine shrimp lethality test (BSLT) and listed in **Table 6**.

2. Data analysis

Table 1. Phytochemical screening tests of the plant extracts

Phytochemical compounds	Tests	Gelenggang leaves extract	Red dragon fruit peel extract
Alkaloids	Mayer's	+	+
Flavonoids	Shibata's	+	+
Glycosides	HCl	+	+
Phenols	FeCl ₃	+	-
Saponins	NaHCO ₃	+	+
Tannins	NaOH	+	+

*HCl = hydrochloric acid, FeCl₃ = ferric chloride, NaHCO₃ = sodium bicarbonate, NaOH = sodium hydroxide

Table 2. Antioxidant content of the plant extracts using DPPH radical scavenging activity

Concentration (µg/mL)	Gelenggang leaves extracts	Red dragon fruit peel extracts	Trolox
20	0.527±0.002	0.509±0.004	0.564±0.004
40	0.605±0.001	0.656±0.004	0.671±0.004
60	0.736±0.001	0.705±0.001	0.744±0.003
80	0.822±0.003	0.843±0.004	0.885±0.002
100	0.893±0.003	0.897±0.003	0.923±0.004

*DPPH = 2,2-diphenyl-1-picrylhydrazyl, Trolox = 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid

Table 3. Antimicrobial activity of the extracts against different test microorganisms through agar disc diffusion assay (values are mean inhibition zone in mm \pm S.D. of three replicates)

Test microorganisms	Gelenggang leaves extracts	Red dragon fruit peel extracts	CMP/FLZ	5% DMSO
MRSA	15.67 \pm 0.29	11.60 \pm 0.17	15.83 \pm 0.06	-
<i>S. aureus</i>	16.67 \pm 0.06	10.17 \pm 0.06	16.13 \pm 0.45	-
<i>E. coli</i>	-	-	27.70 \pm 0.06	-
<i>P. aeruginosa</i>	-	-	24.00 \pm 0.17	-
<i>C. albicans</i>	14.10 \pm 0.10	9.67 \pm 0.06	16.20 \pm 0.10	-

*CMP = chloramphenicol, FLZ = fluconazole, DMSO = dimethyl sulfoxide, (-) no inhibition zone

Table 4. Antimicrobial activity of the extracts against different test microorganisms through agar well diffusion assay (values are mean inhibition zone in mm \pm S.D. of three replicates)

Test microorganisms	Gelenggang leaves extracts	Red dragon fruit peel extracts	CMP/FLZ	5% DMSO
MRSA	23.57 \pm 0.12	17.17 \pm 0.25	23.33 \pm 0.81	-
<i>S. aureus</i>	24.17 \pm 0.23	17.20 \pm 0.53	25.20 \pm 0.00	-
<i>E. coli</i>	-	16.43 \pm 0.23	30.63 \pm 0.06	-
<i>P. aeruginosa</i>	-	12.27 \pm 0.12	13.90 \pm 0.10	-
<i>C. albicans</i>	16.27 \pm 0.06	16.77 \pm 0.06	18.00 \pm 0.10	-

*CMP = chloramphenicol, FLZ = fluconazole, DMSO = dimethyl sulfoxide, (-) no inhibition zone



Figure 1. Cream formulation

Table 5. Evaluation of the formulated cream

Parameters	EcoBioCream
Colour	Faint green
Odour	Pleasant
Texture	Smooth
Grittiness	No grittiness
Feeling after application	Light and emollient
Spreadability	Good
Homogeneity	Homogeneous, no coarse particles
Consistency	Thick
Washability	Easy
Greasiness	Non-greasy
Stability	Stable, no phase separation
pH value	5.43±0.03

Table 6. Brine shrimp lethality test of the plant extract and formulation
(values are the mean number of dead nauplii ± S.D. of three replicates)

Samples (%)	Number of dead nauplii	Percentage of mortality
Gelenggang leaves extract	0.00±0.00	0
Red dragon fruit peel extract	0.00±0.00	0
EcoBioCream	0.00±0.00	0

3. Novelty and uniqueness

The uniqueness of this product lies in its innovative combination of gelenggang leaves, traditionally used for treating skin conditions, and dragon fruit peel, which is often discarded, making it an eco-friendly and sustainable action. This blend creates a synergistic effect that enhances antimicrobial, antioxidant, and anti-inflammatory properties. By repurposing fruit peel waste, the product addresses the rising consumer demand for sustainability and waste reduction in skincare. The growing preference for natural, plant-based products, particularly in personal care and cosmetics, positions this cream to attract customers seeking harmful chemical-free antiseptics. The high antioxidant content in dragon fruit peel contributes to skin repair and protection from oxidative stress, offering added anti-ageing benefits alongside its antiseptic properties. This multifunctional cream combines wound healing, inflammation reduction, and infection prevention with skin rejuvenation, making it a versatile and practical skincare product.

4. Benefit to mankind

EcoBioCream offers numerous benefits and significant contributions to humankind by addressing health, environmental, and sustainability challenges. Its plant-based formulation

combines gelenggang leaves and red dragon fruit peel, providing antimicrobial, antioxidant, and anti-inflammatory properties. This cream effectively combats drug-resistant pathogens like MRSA and *C. albicans*, promotes wound healing, and reduces skin inflammation, offering a natural alternative to chemical-laden antiseptics. The cream's eco-friendly innovation highlights the valorisation of fruit waste, reducing environmental impact and aligning with global sustainability goals. Repurposing red dragon fruit peel minimises agricultural waste while promoting responsible consumption. Additionally, EcoBioCream caters to the increasing demand for natural, chemical-free skincare, ensuring suitability for all skin types, including sensitive skin. It supports a greener economy, offering a sustainable solution for personal care. Through its multifunctionality, EcoBioCream contributes to improving health, preserving the environment, and fostering sustainable development worldwide.

5. Innovation and Entrepreneurial Impact

EcoBioCream is a groundbreaking innovation addressing the growing demand for sustainable, eco-friendly healthcare solutions. By utilising gelenggang leaves for their antifungal properties and repurposing red dragon fruit peel waste, known for its antioxidant and antibacterial benefits, this product exemplifies upcycling food wastes into high-value products. The innovation promotes environmental sustainability and demonstrates economic feasibility by reducing waste and turning it into a resource. As an entrepreneurial venture, EcoBioCream taps into the expanding natural skincare and health product market, appealing to environmentally conscious consumers. Its production process encourages sustainable practices and supports local agriculture by providing new uses for underutilised natural resources. EcoBioCream's dual impact of ecological preservation and health benefits has the potential to inspire similar innovations in green entrepreneurship, offering a scalable model for addressing global sustainability challenges while meeting market demands.

6. Potential commercialisation

EcoBioCream has immense commercialisation potential across diverse industries, leveraging its eco-friendly, plant-based formulation. As an antiseptic cream, it offers a natural remedy for skin conditions, appealing to consumers seeking effective alternatives to synthetic products. Its antifungal and antibacterial properties make it an excellent topical treatment for wound healing, catering to medical and personal care markets. In green cosmetics, EcoBioCream aligns with the growing demand for sustainable beauty solutions, opening avenues for a product line specifically designed for sensitive skin. Its gentle yet potent formulation positions it as a standout choice for individuals prone to allergies or irritation. Expanding into veterinary healthcare, EcoBioCream could be a soothing and safe solution for pet skin issues. Additionally, the product's bio-based ingredients can be repurposed for innovative applications such as food packaging or edible coatings, offering a sustainable alternative to reduce plastic waste while ensuring food safety.

7. Acknowledgment

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8. Authors' Biography



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