

Formulation and Evaluation of a Sheet Mask with Ethanol Extract of Mengkudu (*Morinda citrifolia* L.) as a Moisturizing Agent

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Abstract: Facial skin often faces issues such as acne, dullness, and dryness. Sheet masks are one of the cosmetic care products that can help maintain facial skin hydration. Noni leaves (*Morinda citrifolia* L.) contain secondary metabolite compounds such as alkaloids, tannins, saponins, and flavonoids, which can act as antioxidants. To determine whether noni leaf ethanol extract can be formulated into a sheet mask preparation and its effectiveness as a moisturiser. The research involved several steps: plant identification/determination, sample collection, extraction using the maceration method with 70% ethanol solvent, formulation of the sheet mask preparation, and evaluation, including organoleptic tests, homogeneity, pH, stability, irritation, and moisture effectiveness testing using a skin analyser. Sheet mask preparations with 5%, 7%, and 10% concentrations were found to be thick, homogeneous, with pH ranging from 4.42 to 5.72, non-irritating, stable during storage, and increased skin moisture by 78.94% for F1, 84.0% for F2, and 85.15% for F3. Noni leaf ethanol extract can be formulated into sheet mask preparations and is effective in moisturising the skin. Keywords: Noni leaf extract, sheet mask, moisture.

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Introduction

The outermost organ of the body of living creatures, which functions to protect the body from the outside, is the skin. Skin damage can disrupt human health and appearance. Therefore, the health of the skin needs to be protected and maintained. The leading cause of skin damage is free radicals (Sari & Ernanda, 2021). One of the effects of excessive sun exposure is that it causes water to evaporate on the surface of the skin, causing the skin to become dry. Dry skin is usually characterised by the skin's surface feeling stiff, rough, dull, scaly and even reddish (Ningsih *et al.*, 2019).

One solution offered to treat dry skin types is the use of moisturising cosmetics. Moisturiser

is a product aimed at increasing skin hydration. Generally, skin moisturisers are made from moisturising ingredients, which can form fat on the surface of artificial skin to soften dry and rough skin layers and can reduce water evaporation in the skin. So, several natural ingredients will help moisturise and overcome dry skin. Moisturizing cosmetics that are often formulated, one of which is a facial mask (Herawan *et al.*, 2022). Facial masks are one of the most popular cosmetics in the current era because they can improve skin quality with various types, such as peel-off masks, gel masks, clay masks, wash-off masks, and sheet masks (Afifta, 2024).

One type of mask that people widely use is a sheet mask. Sheet masks are one of the mask

products that have good absorption and penetration, and the packaging is hygienic, efficient, and easy to use. They can only be used once. Sheet masks consist of non-woven fibres made from plant cellulose fibres (Zaky *et al.*, 2023)

An Indonesian plant known for its many benefits, one of which is noni leaves (*Morinda citrifolia* L.). Empirically, noni leaves are used as a compress to heal injured skin and reduce pain. In some areas, infusion of the leaves is consumed as a treatment and analgesic (Rohma *et al.*, 2021). Apart from that, noni leaves are also helpful as an anti-diarrhoea, anti-hypertensive, antibacterial (Zahra, 2022) antidepressant, chemotherapy effect, anti-microbial, antioxidant, anti-dyslipidemia, hepatoprotective activity and immunomodulatory effect (Handayani, 2022).

The chemical content contained in noni leaves (*Morinda citrifolia* L.) is protein, fat, carbohydrates, fibre, calcium, potassium, phosphorus, iron, vitamin A, vitamin B3, and vitamin C. Noni leaves are also rich in antioxidants, such as flavonoids, alkaloids, tannins, triterpenes, saponins, coumarins, and anthraquinones (Mugitasari, 2020).

Many studies have been carried out on noni leaves, such as Mugitasari's (2020) Formulation of Noni Leaf Extract Cream (*Morinda citrifolia* L.) as an Ultraviolet Light Protective Preparation, which shows the most optimal SPF value results are shown in the 20% concentration variation of noni leaf extract cream with an SPF value of 29.916 (Waha & Wijayanti, 2001). Another research by Ernanda (2021), namely the Antioxidant Activity Test of Noni Leaf Extract Cream (*Morinda citrifolia* L.) Based on Vanishing Cream showed a value result at a concentration of 15% of 121.286, which means it has moderate antioxidant activity (Haryoto & Firdaus, 2022).

Based on the discussion above, the author is interested in conducting research entitled Formulation of Sheet Mask Preparations from Ethanol Extract of Noni Leaves (*Morinda citrifolia* L.), which is expected to be a natural moisturiser for the skin. With concentrations of 5%, 7% and 10%, tests on the preparations included homogeneity, pH, irritation, organoleptic, stability and moisture tests.

Material and Methods

Methods

This research uses laboratory experimental research methods, including sample preparation and making noni leaf extract (*Morinda citrifolia* L.). This study aims to determine the antioxidant activity of ethanol extract of noni leaves and sheet mask formulations from noni leaves (*Morinda citrifolia* L.). This research is planned to be carried out at the Pharmaceutical Formulation Laboratory of the Medan Helvetia Health Institute from June to August 2023.

Tool

The tools used in this research were analytical balance, dropper pipette, mortar and stamper, digital pH meter (Hanna), beaker glass, spatula, parchment paper, porcelain cup, glass object, 50 ml measuring cup, stir stick, jar, sorbet, tissue, water bath, plastic pot and moisture checker.

Material

The ingredients that will be used include Noni leaves (*Morinda citrifolia* L.), 70% ethanol, distilled water, carbomer, Na-CMC, propylene glycol, glycerin, sodium benzoate, fragrance, and sheet masks and foil bags (Ramadhan & Isa, 2022).

Procedure

*Procedure Preparation of Noni Leaf Simplisia (*Morinda citrifolia* L.)*

For every 5 kg of fresh noni leaves (*Morinda citrifolia* L.), the best were selected, washed clean, and weighed again at 4.5 kg. The leaves are then chopped, dried in the open air, and placed in a drying cabinet at 50-60°C temperature until brittle. After that, the leaves were re-sorted, ground with a blender, and sieved using a number 40 mesh sieve. As a result, 1.5 kg of noni leaf *Simplicia* powder weighing 1.5 kg was stored in a plastic container protected from direct sunlight, then weighed, and the drying loss was calculated (Ni'am, 2022)

Making Noni Leaf Ethanol Extract

Noni leaf extract is made using the maceration method using a 70% ethanol solution with a ratio of 1:10. A total of 500 grams of noni leaf *Simplicia* powder was soaked in 3.75 litres

of 70% ethanol for 5 days, stirring occasionally, then filtered to separate the filtrate and residue. The residue was rewashed with the remaining 1.25 litres of 70% ethanol for 2 days, stirring occasionally, then filtered again. The first and second filtrates are mixed, then evaporated using

a rotary evaporator at a temperature of 40-50°C until a thick extract is obtained, which is weighed and the per cent yield is calculated, and stored (Anggraini, 2022).

Prepared formula sheet mask

Table 1. Modified Formula for Preparation of Noni Leaf Ethanol Extract Sheet Mask (Veninda, 2003)

Material	Formula			
	F0	F1	F2	F3
Noni leaf extract	0	5%	7%	10%
Glycerin	2,5	2,5	2,5	2,5
Propylene glycol	15 g	16 g	17 g	18 g
Na. CMC	0,3 g	0,3 g	0,3 g	0,3 g
Carbomer	0,3 g	0,3 g	0,3 g	0,3 g
Na.Benzoat	0,3 g	0,3 g	0,3 g	0,3 g
Pewangi	qs	Qs	Qs	Qs
Aquadest	ad 100 mL	ad 100 mL	ad 100 mL	ad 100 mL

Information :

F0 : Blanko

F1 : Formulasi *Sheet mask* Noni Leaf Extract Concentration 5%

F2 : Formulasi *Sheet mask* Noni Leaf Extract Concentration 7%

F3 : Formulasi *Sheet mask* Noni Leaf Extract Concentration 15%

K+ : Garnier® *Sheet mask*

Procedure for making noni leaf extract sheet mask preparation

The necessary ingredients, such as carbomer and Na-CMC, are weighed according to requirements and then developed with hot water in a mortar to form a gel. Glycerin is added to the mixture and stirred until homogeneous, creating a base. Sodium benzoate is dissolved in water, added to the base and stirred. Next, propylene glycol was added and stirred until homogeneous, then distilled water was added little by little along with 5% ethanol extract of noni leaves and stirred until homogeneous. Add sufficient fragrances before campuran dimasukkan ke dalam wadah. Prosedur yang sama dilakukan untuk variasi The concentration of noni leaf ethanol extract was 7% and 10%, then the preparation was evaluated.

Evaluation of sheet mask preparations

Evaluation of sheet mask preparations includes several essential aspects, starting with a homogeneity test to ensure that no coarse particles are detected, followed by organoleptic tests to evaluate the physical visuals of the preparation, such as colour, odour and texture, which show promising results in all formulations. Stability tests were carried out to ensure there

was no change in the odour and colour of the preparation during three months of storage. The pH test shows the level of acidity or alkalinity of the preparation to make sure it doesn't irritate or dry the skin. In contrast, irritation tests were carried out on 15 volunteers to see the skin reaction to the preparation. Moisture tests using a moisture checker were also carried out on 15 volunteers divided into five groups, each testing various concentrations of noni leaf ethanol extract, ensuring the formulation provided an optimal moisturising effect on the skin

Data analysis

The research data were analysed using tabulated data analysis. Tabulation is the process of processing data into data processing tables, which is carried out by entering data into tables and obtaining the results from homogeneity and humidity tests. Furthermore, the data from the research results were processed using statistics, namely the Analysis of Variance (ANOVA) test.

Results and Discussion

Organoleptic test results

The organoleptic results of the noni leaf ethanol extract sheet mask preparation showed

that all formulations had a thick form. Formula F0 has a cloudy white colour with a green tea aroma, while formulas F1, F2, and F3 have a dark brown colour wit.

Table 2. Organoleptic Results of Noni Leaf Ethanol Extract Sheet Mask Preparation

Formula	Organoleptic Results		
	Form	Colour	Smell
F0	Thick	Cloudy white	Green tea aroma
F1	Thick	Dark brown	Typical
F2	Thick	Dark brown	Typical
F3	Thick	Dark brown	Typical

Homogeneity test results

The homogeneity of the noni leaf ethanol extract sheet mask preparation was carried out to determine the quality of the preparation based on the level of uniformity in the preparation's texture. The preparation is said to be homogeneous if the preparation does not have separate granules of substances or colours in the preparation so that the product can work. Effectively, it can increase user comfort with product homogeneity (16). The homogeneity test results of the four formulas showed that the preparations made were homogeneous. This indicates that each formula is distributed homogeneously in the base. Differences in the noni leaf ethanol extract concentration did not affect the homogeneity test results.

pH test results

The pH test results of the noni leaf ethanol extract sheet mask preparation showed that the blank formula had an average pH of 5.72. Formula F1 has an average pH of 4.34, formula F2 has an average pH of 4.16, and formula F3 has an average pH of 4.42. These numbers show that formulas F1, F2, and F3 have a higher acidity level compared to blank formulas (Maysarahm 2023; Leny, 2023).

Table 3. pH Test Results of Noni Leaf Ethanol Extract Sheet Mask

Formulas	Preparation pH			
	P1	P2	P3	Average
Blanko	5,67	5,69	5,82	5,72
F1	4,37	4,35	4,32	4,34

F2	4,25	4,14	4,09	4,16
F3	4,52	4,40	4,35	4,42

Irritation Test Results

The results of the irritation test showed that there was no irritation in the form of itching, redness and roughness on the skin behind the volunteers' ears so the noni leaf ethanol extract sheet mask preparation was safe for use on human skin.

Moisture test results for noni leaf ethanol extract sheet mask

Based on the table above, data obtained on the average percentage increase in moisture percentage for panellists from week 0 to week 4 while using the ethanol extract sheet mask preparation of noni leaves, with an increase of 76.47% in F0, 78.94% in F1, 84.0% in F2, 85.15% in F3, and 88.23% in K+. A total of 15 panellists with regular skin moisture and without the use of other products in the test area were selected for moisture testing using a skin analyser. The test preparation is applied to the skin of the back of the hand and the moisture is measured before and after use with a skin analyser on the same area every week. The percentage of humidity is calculated 2 minutes after application, with the results classified into a scale: dry (3-4%), moderate (4-10%), standard (10-15%), moist (16-20%), and very moist ($\geq 25\%$).

The results showed that the noni leaf ethanol extract sheet mask preparation increased moisture in the moist category for F0 and F1 and was very moist for F2, F3, and K+. According to Mugitasari (2020), noni leaves (*Morinda citrifolia* L.) have potential as an antioxidant because they contain flavonoids, saponins, steroids and alkaloids (Mugitasari, 2020). The phenolic compounds in noni leaves protect body tissue from solar radiation and maintain skin elasticity (Sinaga, 2019). The comparison formula used is the Garnier sheet mask product, which is well known as a skin moisturiser, with compositions such as Aqua, Glycerin, Butylene Glycol, and various other ingredients, most of which act as a moisturiser and maintain skin elasticity (Anggraini, 2022).

Table 4. Moisture Test Results of Noni Leaf Ethanol Extract Sheet Mask

F	P	Initial conditions	Sunday 1st (%)	Sunday 2nd (%)	Sunday The 3rd (%)	Sunday 4th (%) =	% Ascension
F0	1	5	9	11	18	15	76,47
	2	3	9	10	15	19	
	3	5	6	14	15	17	
	Average	4,3	8	11,6	16	17	
F1	1	4	10	22	18	20	78,94
	2	3	7	23	16	20	
	3	5	14	20	19	19	
	Average	4	10,3	21,6	17,6	19,5	
F2	1	3	13	22	22	25	84,0
	2	5	12	20	24	24	
	3	3	14	25	25	27	
	Average	4,3	12,3	22	23,6	25,3	
F3	1	3	19	28	27	25	85,18
	2	5	17	26	30	30	
	3	3	16	25	24	27	
	Average	4,3	18	26	27	27,3	
K+	1	3	17	29	30	40	88,23
	2	7	18	30	35	32	
	3	3	17	31	30	31	
	Average	4,3	17,5	30	32	34	

Data analysis results

Measurement of skin moisture using a skin analyser and data analysis using the One Way Anova test showed a value of $0.000 < 0.05$, which means there is a significant difference in the effectiveness of the moisture content of the noni leaf ethanol extract sheet mask preparation based on different extract concentrations. To find out more about the differences in the effect of concentration, the Tukey HSD test was carried out. The test results showed that in the initial conditions up to week 4, there was no significant difference ($p > 0.05$) between F0 and F1 and F2, as well as F3 and K+. From the first week to the 4th week, there were no significant differences between several formulations, except in the third week, where F0, F1, F2, and F3 did not show significant differences with K+. These results conclude that the moisture activity of F1, F2, and F3 is the same in moisturising the skin and F3 with K+ has similar effectiveness to commercial products on the market, expressed by a p value > 0.05 .

Conclusion

Based on the research results, it can be concluded that the ethanol extract of noni leaves

(*Morinda citrifolia* L.) can be formulated into a sheet mask preparation. The difference in concentration of noni leaf extract affects facial skin's moisture, with the humidity percentage in F1 being 78.94%, F2 being 84.0%, and F3 being 85.15%.

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Reference

- Afifta, S. N. (2024). Evaluasi, Uji Aktivitas Antioksidan Dan Uji Efektivitas Sheet Mask Ekstrak Daun Binahong Merah (*Anredera Cordifolia*) Sebagai Pelembab Wajah. *Indonesian Journal of Health Science*, 4(2), 168-173.
- Anggraini, A. (2022). Formulasi Ekstrak Daun Kersen (*Muntingia Calabural.*) Sebagai Masker Gel Peel Off Dengan Variasi Konsentrasi Ekstrak. Jurusan Farmasi. Tanjung Karang: *Thesis, Politeknik Kesehatan Kemenkes*
- Handayani, R., Qamariah, N., & Bestary, Y. (2022). Formulasi Sediaan Gel Hand

- Sanitizer dengan Kombinasi Ekstrak Lidah Buaya (*Aloe vera L.*) dan Ekstrak Daun Mengkudu (*Morinda citrifolia L.*): Formulation of Hand Sanitizer Gel with Combination of Aloe Vera (*Aloe vera L.*) Extract and Noni Leaves (*Morinda citrifolia L.*) Extract. *Jurnal Surya Medika (JSM)*, 8(3), 282-289.
- Haryoto, & Firdaus, G. (2022). Sitotoksitas Ekstrak Etanol Tumbuhan Mengkudu (*Morinda Citrifolia L*) Terhadap Sel Kanker Serviks . *Seri Mipa Dan Kesehatan* , 401.
- Herawan, D. Q., Kurnia, G. S., Sukmawati, I., & Yuniarsih, N. (2022). Efektivitas sediaan pelembab bahan alam dalam mengatasi kulit kering. *Jurnal Health Sains*, 3(7), 852-857.
- Leny, L., Rudang, S. N., Ginting, I., & Simanjuntak, H. T. (2023). Formulasi Sediaan Lulur Krim Dari Ekstrak Etanol Daun Pepaya (*Carica papaya L.*) Sebagai Pelembab Kulit. *Journal of Islamic Pharmacy*, 8(1), 22-26.
- Maisarah, M., & Chatri, M. (2023). Karakteristik dan Fungsi Senyawa Alkaloid sebagai Antifungi pada Tumbuhan. *Jurnal Serambi Biologi*, 8(2), 231-236.
- Mugitasari, D. E., & Rahmawati, B. (2020). Formulasi Krim Ekstrak Daun Mengkudu (*Morinda Citrifolia L.*) Sebagai Sediaan Pelindung Sinar Ultraviolet. *Jurnal Keperawatan dan Kesehatan Masyarakat Cendekia Utama*, 9(2), 109-119.
- Mugitasari, D. E., & Rahmawati, B. (2020). Formulasi Krim Ekstrak Daun Mengkudu (*Morinda Citrifolia L.*) Sebagai Sediaan Pelindung Sinar Ultraviolet. *Jurnal Keperawatan dan Kesehatan Masyarakat Cendekia Utama*, 9(2), 109-119.
- Ni'am, M., Afifta, S. N., Farlina, N., Deasa, D. G., & Saputri, R. K. (2022). Formulasi dan uji aktivitas antioksidan sheet mask ekstrak daun bayam merah (*Amarantus tricolor*). *Medical Sains: Jurnal Ilmiah Kefarmasian*, 7(04).
- Ningsih, K. S. U., Darsono, F. L., & Wijaya, S. (2019). Formulasi Sediaan Krim Pelembab Ekstrak Air Buah Pepaya (*Carica Papaya L.*). *Jurnal Farmasi Sains dan Terapan (Journal of Pharmacy Science and Practice)*, 6(1), 51-58.
- Ramadhan, & Isa, M. (2019). Perancangan Informasi Manfaat Mengkudu Melalui Media Buku. *Univeristas Komputer Indonesia* (Hal. 1). Bandung: Univeristas Komputer Indonesia Unikom.
- Rohmah, S., Erlin, E., & Rachmawati, J. (2021). Uji Ekstrak Daun Mengkudu (*Morinda citrifolia L.*) Terhadap Zona Hambat Pertumbuhan Bakteri *Escherichia Coli* Secara In-Vitro.
- Sari, D. E. M., & Ernanda, T. H. (2021). Uji Aktivitas Antioksidan Krim Ekstrak Daun Mengkudu (*Morinda Citrifolia L.*) Berbasis Vanishing Cream. *Jurnal Ilmiah JOPHUS: Journal Of Pharmacy UMUS*, 3(01), 10-18.
- Sinaga, I. (2019). *Formulasi Sediaan Masker Sheet dari Sari Buah Semangka (Citrullus lanatus Thunb. Matsumura & Nakai)* (Doctoral dissertation, Institut Kesehatan Helvetia Medan).
- Veninda, H. R., Belinda, A. M., & Muhaimin, R. M. F. (2023). Indonesian Journal of Biological Pharmacy. *Journal homepage: https://jurnal.unpad.ac.id/ijbp*, 3(2), 63-73.
- Waha, M. G., & Wijayanti, L. (2001). *Sehat Dengan Mengkudu (Morinda Citrifolia L) (Edisi Kedua Revisi)*. Jakarta: Msf Group Jakarta.
- Zahra, A. I., Yuziani, Y., & Rahayu, M. S. (2022). Daya Hambat Ekstrak Daun Mengkudu (*Morinda citrifolia L.*) terhadap Pertumbuhan Bakteri *Bacillus cereus*. *Jurnal Ilmiah Universitas Batanghari Jambi*, 22(3), 1458-1462.
- Zaky, M., Junaidin, J., & Yulyianti, R. (2023). Potensi Krim Ekstrak Etanol Daun Mengkudu (*Morinda citrifolia L.*) Terhadap *Staphylococcus aureus*. *Journal of Pharmacopolium*, 6(1).