
Formulation Of Sheet Mask Preparation Combination Of Moringa Leaves (*Moringa Oleifera L.*) And Telang Flowers (*Clitoria Ternatea L.*) And Physical Quality Test

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Abstract

The Indonesian cosmetics industry is growing rapidly with increasing demand for herbal sheet masks due to premature aging and pollution. The combination of Moringa oleifera L. leaves and Clitoria ternatea L. flowers has antioxidant potential, but formulation studies are limited. To formulate a sheet mask combining infusions of both plants and evaluate its physical quality. Quantitative descriptive study with qualitative observation. The sheet mask formula population, 3 replications per formula and 20 respondents for irritation test. Instruments: pH meter, viscometer, skin analyzer; descriptive analysis and Shapiro-Wilk (SPSS). The formula is stable with a pH of 4.97-5.77, viscosity of 173-266 cps, spreadability of 5.8-6.2 cm, homogeneous, good organoleptic, free from irritation, and increased humidity up to 60%. Data are normal ($p > 0.05$). The preparation meets the physical quality standards of the Indonesian Herbal Pharmacopoeia, has the potential to be a safe local skincare product.

Keywords: Antioxidants, Butterfly Pea Flowers, Moringa Leaves, Physical Quality, Sheet Mask.

INTRODUCTION

The cosmetics industry in Indonesia has experienced rapid growth in recent years, with a market value reaching IDR 158 trillion in 2025 and projected to continue growing by 4.73% annually until 2029 (Ratnasih Sugianto, 2023; Mustika Ratu, 2025). Sheet masks have become a popular product due to their ease of use and ability to provide intensive moisture to facial skin, driven by the trend of natural skincare products that consumers are interested in (Chaniago & Chaerunisaa, 2023).

Demand for herbal-based sheet masks is increasing as an antioxidant, moisturizing, and anti-aging solution, in line with public awareness of the safety of natural ingredients (Ferica et al., 2025). Data shows that sheet masks are the most frequently used by 63% of respondents in a related study, illustrating the growing trend of preventative skin care amidst urban lifestyles (Ferica et al., 2025).

Facial skin is susceptible to damage from exposure to free radicals from air pollution and environmental factors, which damage the skin barrier, which has an ideal pH of 4.5–6.0, reducing moisture and triggering premature aging (Mongabay, 2025; Shin et al., 2023). This imbalance causes oxidative stress that attacks collagen and elastin, resulting in wrinkles and hyperpigmentation, common skin problems in Indonesia (Gajdka et al., 2024).

The use of synthetic cosmetics often causes irritation and instability, while natural ingredients such as Moringa oleifera L. leaves and Clitoria ternatea L. flowers have not been widely explored in combination for sheet masks (Nurwaini et al., 2024; Putri et al., 2025). Research shows limited studies on combined formulations of the two, despite each having strong antioxidant potential, creating a gap in the development of effective local products (Ferdinand & Ciptono, 2022).

This problem is exacerbated by the lack of innovation in herbal sheet masks that are physically stable and safe for sensitive skin, where variations in formulas still need to be tested to meet quality standards such as pH, viscosity, and spreadability (STIFERA Journal, 2024).

This study aims to formulate a sheet mask combining Moringa leaf and butterfly pea flower infusions and evaluate its physical qualities, including organoleptic, homogeneity, pH, viscosity, spreadability, irritation, and moisture. The urgency of this research lies in its contribution to the local cosmetics industry, which is growing double-digit, providing a safe alternative based on endemic Indonesian plants (Coordinating Ministry for Economic Affairs, 2026). The novelty of this research is the development of a unique combination formula that has not been widely studied, potentially

serving as a reference for halal and environmentally friendly skincare innovations (UWKS Journal, 2025; Pharmacon Journal, 2025).

RESEARCH METHOD

Types and Methods of Research

This research is descriptive with a quantitative approach supported by qualitative observations to describe the formulation and physical quality of a sheet mask preparation combining *Moringa oleifera* L. leaf infusion and *Clitoria ternatea* L. flower. This approach allows for the numerical measurement of variables such as pH, viscosity, spreadability, homogeneity, organoleptic, irritation, and moisture through laboratory tests, in accordance with the definition of descriptive research that emphasizes the systematic description of phenomena (Sugiyono, 2021; Sudaryono, 2021). The quantitative method was chosen because it involves numerical data that is analyzed statistically, while qualitative elements such as organoleptic observations complement the description of the preparation's quality (Emzir, 2021; Creswell & Creswell, 2023).

Data Analysis Instruments and Techniques

The research instruments included laboratory equipment such as a pH meter, viscometer, stopwatch for spreadability, and observation sheets for organoleptic, homogeneity, irritation, and moisture tests, which were calibrated to ensure measurement accuracy. Data collection techniques included the preparation of herbal medicines, infusion extraction, sheet mask formulations with varying concentrations, and physical quality evaluations according to the Indonesian Herbal Pharmacopoeia standards (Ministry of Health of the Republic of Indonesia, 2017). Data analysis used statistical descriptions (mean, standard deviation) and the Shapiro-Wilk normality test with SPSS software to assess data distribution ($p < 0.05$), which aligns with descriptive quantitative analysis procedures (Sugiyono, 2021; Sudaryono, 2021).

Population and Sample

The study population comprised all variations of sheet mask formulas produced from a combination of *Moringa* leaf and butterfly pea flower infusions. Samples were taken purposively, with inclusion criteria including a stable formula and exclusion of damaged or contaminated ingredients. The sample size included three replicate formulas for the physical quality test, with 20 respondents for the skin irritation test based on the criteria of 18-40 years of age, normal skin, and no allergies (Maslahah, 2024). This sample selection followed the principles of non-probability sampling appropriate for experimental descriptive research in the field of cosmetic pharmaceuticals (Emzir, 2021; Creswell & Creswell, 2023).

Research Procedures

The procedure begins with plant identification in the laboratory, collection of fresh *Moringa* leaves and telang flowers, and preparation of the crude drug through sorting, washing, chopping. This is followed by infusion extraction at 90°C for 15 minutes, sheet mask formulation with varying infusion concentrations (Rahmatillah et al., 2025), phytochemical screening, and a step-by-step evaluation of physical quality. All steps are carried out in the Pharmacy Laboratory of Duta Bangsa University, Surakarta, using a pre-post test experimental design to measure parameter changes and ensure validity and reliability according to the drug development research protocol (Sugiyono, 2021; Sudaryono, 2021).

RESULTS AND DISCUSSION

Plant Determination

Plant identification was conducted at the Tawangmangu Agricultural Research and Development Center (UPF Yankestrad), Central Java. The results showed that the tested samples were Moringa oleifera L., the Moringa leaf plant, and Clitoria ternatea L., the ...

Making Moringa Leaf and Butterfly Pea Flower Infusion

Making infusion of moringa leaves (Moringa oleifera L.) and telang flowers (Clitoria ternatea L.). The results for moringa leaves are brownish green and telang flowers are purplish blue, in liquid form, clear, and there is no sediment because it goes through a filtering process.

Phytochemical Screening

The results of phytochemical screening of moringa leaf and butterfly pea flower infusions can be seen in the following table:

Table 1. Results of phytochemical screening tests on moringa leaves and butterfly pea flowers

Compound	Reagent	Results	Information
		Moringa leaves telang flowers	
Flavonoid	Mg powder and concentrated HCL	Color formed	Color formed +
		Red orange	
Alkaloid	Mayer	There is sediment	There is sediment +
	Dragendorph	There is sediment	There is sediment +
	Wagner	Chocolate	Chocolate +
Tannin	FeCl3	Green Blue	Blackish Color +
Saponin	Aquadest + HCL	There is foam	There is foam +
		Stable	stable
Steroid	Chloroform + H2SO4	Red color	Red color +
Triterpenoid	Chloroform + H2SO4	Didn't happen	Didn't happen -
		Changes	Changes

Description: (+) contains metabolite compounds
 (-) does not contain metabolite compounds

Sheet mask preparation formulation

Table 2. Sheet mask preparation formulation

Composition	F0	FI	FII	FIII	Function
Moringa leaf infusion	-	3%	2%	1%	Active ingredients
Butterfly pea flower infusion	-	1%	2%	3%	Active ingredients
Glycerin	5%	5%	5%	5%	Humectant
Butylene glycol	5%	5%	5%	5%	Humectant
Hydrosol	3%	3%	3%	3%	Solvent
Xanthan gum	0.2%	0.2%	0.2%	0.2%	Thickener
PVP	0.1%	0.1%	0.1%	0.1%	Purifier
PEG	0.1%	0.1%	0.1%	0.1%	Stabilizer
Methyl paraben	0.1%	0.1%	0.1%	0.1%	Preservative
Propyl paraben	0.1%	0.1%	0.1%	0.1%	Preservative
Citric acid	0.1%	0.1%	0.1%	0.1%	pH adjustment
Aquadest Ad	100	100	100	100	Solvent
Sheet mask sheet	4	4	4	4	Media

Based on the results of the preparation, all sheet mask formulas (F0, FI, FII, FIII) were successfully made and did not experience phase separation, clumping, or unwanted changes in shape.



Picture 1. Sheet mask formulation results (Researcher documentation)

Evaluation of the Physical Quality of Sheet Mask Preparations Organoleptic Test Results

Table3.Organoleptic results

Formula	Smell	Color	Texture
F0	Typical rose	Clear	Thick
FI	Typical rose	Gray	Thick
FII	Typical rose	Violet	Thick
FIII	Typical rose	Deep purple	Thick
P	Typical	Clear	Thick

Information

F0 : Blank (without infusion)
 FI : Preparation with infusion
 FII : Preparation with infusion
 FIII : Preparation with infusion
 P : Comparator

Homogeneity Test Results

Table4. Homogeneity test results

Formula	Replication 1	Replication 2	Replication 3
F0	Homogeneous	Homogeneous	Homogeneous
FI	Homogeneous	Homogeneous	Homogeneous
FII	Homogeneous	Homogeneous	Homogeneous
FIII	Homogeneous	Homogeneous	Homogeneous
P	Homogeneous	Homogeneous	Homogeneous

Information

F0 : Blank (without infusion)
 FI : Preparation with infusion
 FII : Preparation with infusion
 FIII : Preparation with infusion
 P : Comparator

pH Test Results

Table 5. Sheet mask pH test results

Formula	Replication 1	Replication 2	Replication 3
F0	5.03	5.68	5.7
FI	5.15	5.29	5.63
FII	5.0	5.13	5.23
FIII	4.97	5.67	5.70
P (Comparator)	5.65	5.80	5.85

Table 6. Average pH value (mean ± SD)

Formula	pH (mean ± SD)
F0	5.47 ± 0.36
FI	5.36 ± 0.25
FII	5.12 ± 0.12
FIII	5.45 ± 0.41
P (Comparator)	5.77 ± 0.10

Viscosity Test Results

Table7. Viscosity measurement results

Formula	1 cps replication	2 cps replication	3 cps replication
F0	291	253	255
FI	219	249	277
FII	156	181	183
FIII	236	295	257
P (Comparator)	391	351	376

Table 8. Average viscosity values (mean ± SD)

Formula	Viscosity (cps) mean ± SD
F0	266.3 ± 21.7
FI	248.3 ± 29.1
FII	173.3 ± 14.6
FIII	262.7 ± 29.8
P (Comparator)	372.7 ± 20.1

Spreadability Test Results

Table 9. Results of spreading power measurements

Formula	Replication 1	Replication 2	Replication 3
F0	5.3	5.9	6.7
FI	5.3	5.5	6.7
FII	5.8	6.1	6.7
FIII	5.4	6.5	6.8
P (Comparator)	6.2	6.4	7.3

Table 10. Average value of dispersion power (mean ± SD)

Formula	Spread power (cm)
F0	6.0 ± 0.7
FI	5.8 ± 0.8
FII	6.2 ± 0.5
FIII	6.2 ± 0.7
P (Comparator)	6.6 ± 0.6

Irritation Test

Table 11. Results of the Skin Irritation Test for the Combination Infusion Sheet Mask Preparation moringa leaves and butterfly pea flowers

Panelists (age)	F0	FI	FII	FIII
BA (25)	-	-	-	-
LF (21)	-	-	-	-
BI (21)	-	-	-	-
CH (21)	-	-	-	-
TA (23)	-	-	-	-
TR (23)	-	-	-	-
BL (23)	-	-	-	-
NJ (24)	-	-	-	-
MA (23)	-	-	-	-
BK (24)	-	-	-	-

Humidity Test

Table 12. Results of Moisture Testing of Sheet Mask Preparations

Respondents	Formulation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Average
1	FO	43.3	58.9	47.0	64.1	57.3	56.7	54.5
	FI	41.3	54.7	54.4	53.3	55.4	51.2	51.7
	FII	57.1	43.7	52.2	63.8	55.5	46.5	53.1
	FIII	41.4	53.1	41.8	55.5	57.9	45.1	49.1
2	FO	40.2	56.2	64.1	57.3	48.3	52.5	53.1
	FI	40.5	48.2	54.3	47.4	59.1	48.8	49.7
	FII	40.4	54.9	40.8	55.9	58.7	45.3	49.3
	FIII	55.8	50.5	63.8	56.2	57.7	50.2	55.7
3	FO	48.6	54.9	55.5	59.9	51.9	54.6	54.2
	FI	57.5	59.3	55.3	54.8	52.6	57.1	56.1
	FII	52.3	50.8	57.5	55.8	53.3	60.0	54.9
	FIII	56.6	54.2	52.3	48.6	52.5	60.0	54.0

Statistical Data Analysis

Results of the Normality Test of Spread Power

Based on the results of the Shapiro-Wilk normality test on the dispersion parameter, significant values were obtained for each formula F0: 0.843; F1: 0.253; F2: 0.637; F3: 0.391; Comparison (IV): 0.328. All of these significance values are greater than 0.05, so the dispersion data is normally distributed. The results of the dispersion normality test are attached in the appendix.

pH Normality Test Results

The results of the normality test using Shapiro-Wilk on the pH parameter showed significant values for each formula, namely F0: 0.050; F1: 0.549; F2: 0.856; F3: 0.069; and the comparison (F IV): 0.463. All significance values were above the significance limit of 0.05, so the pH data were declared normally distributed.

The significance value of 0.050 for F0 still meets the normality criteria because it is within the specified significance limit ($p \geq 0.05$). The results of the normality test using SPSS can be seen in the appendix.

Viscosity Normality Test Results

Based on the results of the Shapiro-Wilk normality test on the viscosity parameters, the significance values (p) for each formula were obtained, namely F0: 0.253; F1: 0.962; F2: 0.127; F3: 0.843; and the comparison preparation (FIV): 0.537. All significance values were greater than 0.05, so the viscosity data were declared normally distributed.

Based on the results of the normality test for all physical quality parameters, namely spreadability, pH, and viscosity, it can be concluded that all data are normally distributed ($p \geq 0.05$). Thus, the test results meet the requirements. The output of the normality test is presented in the appendix.

DISCUSSION

Phytochemical Screening

The results of phytochemical screening showed that the infusion of *Moringa oleifera* L. leaves and *Clitoria ternatea* L. flowers positively contained flavonoids, alkaloids, tannins, saponins, and steroids, while triterpenoids were not detected.

The presence of flavonoids in infusion is in line with research Fachriyah et al., (2020) which reported that moringa leaf extract has strong antioxidant activity related to its flavonoid and phenolic compound content. Flavonoids act as free radical scavengers and can protect skin cells from oxidative stress. Furthermore, research (Sholihatunnisa & Ramadhania, 2024) Studies have shown that telang flowers contain anthocyanins and flavonoids, which act as natural antioxidants and anti-inflammatories. This content supports the potential use of telang flowers in cosmetic formulations.

The positive results in the tannin test are also in line with research Hasanah et al., (2023) which states that telang flowers contain polyphenolic compounds, including tannins, which have antioxidant and skin-protective activity. Meanwhile, triterpenoid results were not detected due to the infusion method using water as a solvent. WHO, (2018) The infusion method is more effective in extracting polar compounds such as flavonoids and tannins, while non-polar triterpenoid compounds tend to be less extractable in water solvents.

This study is consistent with previous literature and shows that the combination of *Moringa* leaves and telang flowers has secondary metabolite compounds that support antioxidant activity.

Sheet mask preparation formulation

The preparation of a sheet mask preparation combining *Moringa oleifera* L. leaf infusion and *Clitoria ternatea* L. flower infusion produced four stable formulas without phase separation. These formulation results indicate that the base used is able to maintain the physical stability of the preparation.

This result is in line with research Leny et al., (2023) who reported that the combination of humectants (glycerin and butylene glycol) and the thickener xanthan gum was able to produce a physically stable sheet mask preparation without phase separation. Another study by Suwandi &

Kustiawan, (2024) showed that the use of PEG-40 hydrogenated castor oil as a solubilizer can improve the homogeneity and stability of herbal sheet mask essences. Differences in color intensity between formulas in this study were influenced by the concentration of butterfly pea flower infusion, which contains anthocyanins.

This is in accordance with research Putri et al., (2025) which states that anthocyanins are sensitive to concentration and can increase the color intensity of water-based cosmetic preparations.

Thus, the formulation results in this study are consistent with previous literature and show that variations in infusion concentration affect visual characteristics without compromising the stability of the preparation.

Organoleptic Test

Organoleptic testing results showed that all formulas had a thick consistency and a distinctive rose scent derived from the hydrosol. The thick consistency of essence sheet masks is a common characteristic of humectant- and hydrophilic thickener-based preparations.

This result is in line with research Kusumawati et al., (2020) which states that a 0.2% xanthan gum base produces a semi-thick texture suitable for sheet mask preparations. Research by (Bioedutech et al., 2023) reported that natural ingredient-based sheet mask preparations showed color changes with increasing extract concentration, but did not affect consistency.

Thus, the color difference in this study is a natural effect of increasing anthocyanin concentration and does not indicate instability of the preparation.

Homogeneity Test

The homogeneity test results showed that all sheet mask preparations were good. Both the formulas (FO, FI, FII, FIII) and the comparators were homogeneous in each replication. These results align with research by Kusumawati et al. (2020), which states that sheet mask preparations with an appropriate base and a good mixing process will produce a homogeneous sheet mask preparation despite variations in active ingredient concentration.

The homogeneity test was carried out to determine the uniformity and evenness of the mixed base in both the formulated preparations and the comparison preparations. Tjitrarukmana, (2022)

Ph Test

The pH value of all sheet mask formulas produced is within the physiological pH range of human skin, namely 4.5–6.5. This range represents the degree of acidity naturally present on the skin's surface and is known as the acid mantle. The presence of a pH within this range is very important because it plays a role in maintaining the integrity of the skin barrier, maintaining the balance of normal skin microflora, and minimizing the risk of irritation. According to the provisions of the Indonesian Food and Drug Supervisory Agency (BPOM), topical cosmetic preparations should have a pH that matches the physiological pH of the skin, namely in the range of 4.5–6.5 to remain safe and comfortable when used.

According to Shin et al., (2023), The physiological pH of facial skin is generally in the range of 4.5–6.0, and changes in pH that are too acidic or too alkaline can disrupt the function of the epidermis, including reducing the ability to protect against irritants and pathogenic microorganisms. If the preparation has a pH below 4.5, it has the potential to cause a burning sensation and irritation, while a pH above 6.5 can cause disruption to the skin's protective layer so that the skin becomes drier and susceptible to barrier damage. Thus, pH stability is an important parameter in evaluating the physical quality of sheet mask preparations.

The results of this study are also in line with the findings Chaniago & Chaerunisaa, (2023) which reports that herbal sheet masks have a pH range of 5.0–5.8 and are considered safe for topical use. This range is close to the skin's natural pH, so it doesn't disrupt the skin's physiological balance.

The formula with a higher concentration of butterfly pea flower infusion showed a slightly lower pH value than the other formulas. This condition is likely influenced by the content of phenolic compounds and anthocyanins, which are weakly acidic, as explained by Hasanah et al., (2023) These

compounds can contribute to increasing the acidity of the preparation, although the changes that occur are still within safe limits according to skin physiological standards.

Overall, variations in infusion concentrations within the formulations did not cause extreme pH changes, and all preparations remained within the physiological pH range required by the Indonesian Food and Drug Authority (BPOM). This indicates that the developed sheet mask formulations maintain good acidity stability and meet the safety requirements for topical use.

Viscosity Test

The viscosity values obtained in this study ranged from 173 to 266 cps. This range indicates the semi-thick nature of the preparation, allowing the essence liquid to be easily distributed and absorbed evenly on the sheet mask. A consistency that is neither too runny nor too thick is crucial in sheet mask formulation, as it will affect the solution's ability to penetrate the mask fibers and its comfort when applied to the skin. If the viscosity is too low, the liquid may drip and not be optimally retained on the sheet mask, while a viscosity that is too high can inhibit the release of active ingredients to the skin's surface.

According to Kusumawati et al., (2020), the viscosity of a good sheet mask preparation is in the range of 137–275 cps. The results of this study are still within this range and can be categorized according to the recommended physical quality standards. In addition, research by Bioedutech et al. (2023) reported that gel-based mask preparations have a viscosity between 230–1150 cps. Compared to this range, the viscosity in this study is included in the optimal category for liquid essence preparations used in sheet masks, because it does not require a consistency as thick as conventional gels.

Differences in viscosity values between formulas are likely influenced by the concentration and interaction of viscosity-forming ingredients, particularly xanthan gum, with the solvent and active ingredients. Xanthan gum is a hydrophilic polymer capable of forming colloidal systems through hydration and a three-dimensional network in the aqueous phase. When dispersed in water, xanthan gum swells and increases flow resistance, thereby increasing the viscosity of the preparation. The higher the concentration of xanthan gum or the stronger the interaction with other components in the formula, the denser the network structure formed, resulting in greater viscosity.

Furthermore, the presence of active ingredients and other components, such as humectants, can also affect the rheological system of a preparation. The interaction between xanthan gum and dissolved compounds can cause changes in viscosity due to differences in hydrogen bond strength and molecular distribution within the system. Therefore, variations in the concentration of active ingredients in a formula can contribute to measured viscosity differences, although these may still be within the acceptable range for sheet mask preparations.

Overall, the viscosity values obtained indicate that the formulation has the appropriate consistency to maintain physical stability, facilitate application, and support optimal release of active substances on the skin surface.

Spread Power Test

The spreadability values for all formulas were in the range of 5–7 cm, which is within the acceptable range for topical preparations. This range indicates that the formulation has good spreadability when applied with a certain amount of pressure, making it easy to spread evenly across the skin surface. Tjitrarukmana, (2022), the ideal spread for topical gel preparations is in the range of 5–7 cm to provide comfort during application and allow even distribution of the active substance.

Based on the data in Tables 6 and 7, it can be seen that each formula exhibits a relatively stable spread diameter with each load increase. Increasing the load causes the spread diameter to gradually increase, indicating that the formulation has good flow properties when subjected to external pressure. This indicates that the formulation system is able to respond to pressure forces by expanding the spread surface without experiencing phase separation or drastic changes in consistency.

The differences in spreadability values between the formulas in the table show variations that are not very significant, but still show a certain pattern. Formulas with higher viscosity values tend to

have slightly smaller spreadability diameters than formulas with lower viscosity. This phenomenon is consistent with the theory that the relationship between viscosity and spreadability is inversely proportional, as explained by Kusumawati et al., (2020), where increasing viscosity will increase flow resistance so that the distribution area becomes smaller.

In the context of sheet mask formulations, the spreadability parameter plays a crucial role in ensuring that the essence is evenly distributed across the sheet and optimally transferred to the skin's surface. If the spreadability is too low, the essence tends to be retained within the mask's structure and poorly distributed across the skin. Conversely, if it is too high, the formulation can potentially be too runny and drip easily during application. The results in Tables 6 and 7 indicate that all formulas are within ideal limits, thus achieving a good balance between viscosity and spreadability.

Overall, the spreadability measurements in both tables showed consistency between replicates and no extreme deviations, indicating good physical stability. Therefore, based on the spreadability parameter, all sheet mask formulas met the physical quality requirements for topical preparations and were consistent with the rheological theory of semisolid preparations.

Irritation Test

Based on the irritation test results listed in Table 8, no redness (erythema), itching, edema, or burning sensation was found in any of the respondents during the observation period. This indicates that the formulated sheet mask preparation is considered safe for topical use on human skin. Patch testing is a common procedure used to evaluate the potential for hypersensitivity reactions or primary irritation of a cosmetic preparation before it is declared safe for use. (Meirista et al., 2025).

Respondents in this study consisted of men and women with normal skin conditions and no history of allergies to herbal ingredients or cosmetics. Based on the data in Table 8, both male and female respondents showed consistent results, namely no irritation reactions to all formulas tested. This indicates that gender differences do not significantly influence skin response to the formulations. Physiologically, although there are differences in skin thickness and sebum levels between men and women, responses to formulations with a physiologically appropriate skin pH generally do not show significant differences. (Shin et al., 2023).

The safety of this preparation is also supported by its pH value, which is within the skin's physiological range, so it does not disrupt the skin barrier function. Preparations with an appropriate pH are known to have a lower risk of irritation than preparations with a pH that is too acidic or too basic (Shin et al., 2023). Meirista et al. (2025) reported that a natural-based sheet mask with a pH that suits the skin did not cause reactions in patch tests, so the results of this study are consistent with these findings.

In addition to pH, the active compounds in moringa leaf and butterfly pea flower infusions also contribute to the reduced potential for irritation. Moringa leaves and telang flowers are known to contain flavonoids with anti-inflammatory and antioxidant activity, which can help soothe the skin and reduce the potential for mild inflammatory reactions. (Magharaniq Safira Purwanto & Aprilia, 2022) This anti-inflammatory activity works by inhibiting the release of inflammatory mediators, thereby minimizing redness or mild irritation of the skin (Magharaniq Safira Purwanto & Aprilia, 2022).

Overall, the irritation test results in Table 8 indicate that all sheet mask formulas are safe for use on both male and female respondents with normal skin conditions. The absence of adverse reactions during the observation period confirms that the formulations meet basic safety requirements for topical cosmetic preparations and are consistent with the literature stating that natural-based preparations with a physiological pH level of the skin have good tolerability (Meirista et al., 2025; Shin et al., 2023).

Humidity test

Test results showed an increase in skin moisture levels after using the sheet masks with all formulas. Moisture measurements were performed using a skin analyzer, which detects water content in the stratum corneum using bioimpedance or a digital moisture sensor. This device allows for

quantitative evaluation of changes in skin hydration before and after application, resulting in more objective and measurable data.

Based on the data in Table 9, all formulas experienced an increase in moisture content compared to the respondents' initial skin condition. However, one formula showed the greatest increase compared to the others. This indicates that variations in the concentration of active ingredients and humectant composition in the formulas provide a more optimal hydration effect. The differences in moisture content between the formulas in the table indicate the effect of composition on the formulation's effectiveness as a moisturizer.

This increased moisture can be explained by the presence of glycerin and butylene glycol in the formula, which function as humectants. According to Chaniago & Chaerunisaa (2023), these two ingredients work by attracting water molecules from the environment and retaining them in the stratum corneum, thereby increasing skin hydration levels. This mechanism helps improve dry skin conditions and increases skin surface elasticity.

Furthermore, active ingredients also play a role in increasing hydration. Research by Fadilah Kumala Putri et al. (2025) reported that butterfly pea flower extract can increase skin moisture due to its antioxidant flavonoid and anthocyanin content. These antioxidant compounds help reduce oxidative stress on the skin, thereby maintaining optimal barrier function. Shin et al. (2023) stated that antioxidants play a role in maintaining the integrity of the skin barrier, which ultimately improves the skin's ability to retain water.

When compared to the data in Table 9, the formula with the highest moisture increase indicates that the combination of humectants and active ingredient concentrations in the formula provides a synergistic effect in increasing skin hydration. All formulas showed a consistent upward trend, thus concluding that the formulated sheet masks are effective as skin moisturizers.

Normality Test of Spread Power

Based on the results of the Shapiro-Wilk normality test on the dispersion power parameters, significant values were obtained for each formula F0: 0.843; F1: 0.253; F2: 0.637; F3: 0.391; Comparator (IV): 0.328. All of these significance values are greater than 0.05, so the dispersion power data is normally distributed.

This result is in line with research Kusumawati et al., (2020) who reported that the spreadability data on gel-based sheet mask preparations showed a normal distribution because the formula was homogeneous and did not experience phase separation. Research by Tjitrarukmana, (2022) also said that the normal distribution of the spreadability parameters indicates that the viscosity and gel structure are stable and the variation between replicates is small.

The normal distribution of spreading power in this study was probably caused by the consistency of the testing method and the stability of the gel system formed from xanthan gum, so that there were no extreme fluctuations between repetitions.

pH Normality Test

The results of the normality test using Shapiro-Wilk on the pH parameter showed significant values for each formula, namely F0: 0.050; F1: 0.549; F2: 0.856; F3: 0.069; and the comparison (F IV): 0.463. All significance values were above the significance limit of 0.05, so the pH data were declared normally distributed.

The significance value of 0.050 for F0 still meets the normality criteria because it is within the specified significance limit ($p \geq 0.05$).

This result is in line with research Chaniago & Chaerunisaa, (2023) who reported that the pH data of herbal sheet mask preparations showed a normal distribution because the pH adjustment process was carried out consistently and in a controlled manner.

Viscosity Normality Test

Based on the results of the Shapiro-Wilk normality test on the viscosity parameters, the significance values (p) for each formula were obtained, namely F0: 0.253; F1: 0.962; F2: 0.127; F3:

0.843; and the comparison preparation (FIV): 0.537. All significance values were greater than 0.05, so the viscosity data were declared normally distributed.

Based on the results of the normality test for all physical quality parameters, namely spreadability, pH, and viscosity, it can be concluded that all data are normally distributed ($p \geq 0.05$). Thus, the test results meet the requirements.

This result is in line with research Bioedutech et al., (2023) who reported that the viscosity of gel-based mask preparations showed a normal distribution if there was no degradation of the gel structure.

Study Kusumawati et al., (2020) also stated that the normal distribution of viscosity indicates the stability of the polymer structure in the dosage system.

CONCLUSION

This study successfully formulated a sheet mask combination of *Moringa oleifera* L. leaf infusion and *Clitoria ternatea* L. flower with four variations of physically stable formulas, meeting quality standards including good organoleptic, perfect homogeneity, pH 4.97-5.77 according to skin physiology, viscosity 173-266 cps optimal for application, ideal spread of 5.8-6.2 cm, free of irritation in 20 respondents, and significant increase in skin moisture up to 60%. Phytochemical screening confirmed the content of flavonoids, alkaloids, tannins, saponins, and steroids that support antioxidant potential. Data were normally distributed ($p > 0.05$) through the Shapiro-Wilk test, proving the quality of the preparation meets the Indonesian Herbal Pharmacopoeia.

However, limitations of this study include a focus solely on physical quality without further biological testing such as *in vivo* antioxidants or long-term stability, and limited samples to normal skin without extreme skin type variations. Suggestions for future research include evaluation of DPPH antioxidant activity, microbiological clinical trials, and 6-month cyclic stability. Practically, these results have implications for the development of safe, effective, and locally sourced halal skincare products based on endemic plants, supporting Indonesian cosmetic MSMEs in a market worth IDR 158 trillion with export potential.

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