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The Potency of Moringa Leaf Extract (*Moringa oleifera* L.) In a Facial Treatment Mist Formulation Over Acne and Bacteria

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ABSTRAK

Background: It is often known that moringa leaves (Moringa oleifera L.) are a natural substance with many advantages, especially for their antibacterial qualities that prevent the growth of bacteria. Objectives: The main objective of this study was to evaluate the efficacy of particular face mist preparation made from Moringa leaf extract in inhibiting the growth of Propionibacterium acnes, the bacteria that causes facial acne. Methods: A facial mist containing moringa extract was created, and its antibacterial qualities were assessed using the Kirby-Bauer technique in conjuction with the agar duffision method. Results: The face mist preparation effectively satiated the homogeneity, pH, viscosity, and spray pattern physical assesment criteria in the organoleptic test. Conclusions: Strong anti-acne and antibacterial properties were present in the face mist preparation made from moringa leaf extract, especially at a concentration of 45% that sucesfully stopped the growth of all test.

INTRODUCTION

Acne vulgaris is an infectious skin disease caused by Propionibacterium acnes. This microorganism is found in the infra-infundibulum area and can reach the skin surface by following the sebum flow. Increasing the amount of triglycerides in sebum will raise the number of the bacteria. These bacteria play a role in causing inflammation by producing chemotactic factors and lipase enzymes that convert triglycerides into free fatty acids and stimulate acne formation associated with the proliferation of abnormal keratinocytes, abnormal keratinocyte proliferation, adhesion and differentiation of the lower branches of follicle (Indarto, I, et al. 2019)

Staphylococcus epidermidis commonly causes swellings (abscesses) including acne, skin, urinary tract, and kidney disease. Additionally, Staphylococcus aureus is a prevalent pathogenic bacteria in the human body (Putra Riswana, A, et al. n.d). It constitutes part of the normal flora of the skin, respiratory, and food digestive tract in humans. Normal flora is a group of microorganisms that live on the skin and mucous membranes or mucosa of healthy and sick humans. However, the presence in the body parts is not always beneficial, causing diseases under certain conditions (Djumaati, F, Yamlean, P. V. Y and Lolo, W. A 2018).

Plants have potential as antibacterials due to their characteristic production of repellant compounds against bacteria. The compounds producedare known as secondary metabolites derived from secondary metabolic processes (Nurjannah, I, et al. 2022). Moringa (*Moringa oleifera L.*) plant, often referred to as the miracle tree, contains antibacterial properties in various partsfrom the leaf to the roots (Ishak, P. Y, et al. 2022)

Moringa leaf has flavonoid secondary metabolite compounds that play a role in damaging bacterial cell membranes in the phospholipid section, thereby reducing permeability. This leads to cell swelling and bacterial lysis (Putra Riswana, A, et al. n.d). Indriastuti et al. (2023) concducted a study that Moringa leaf extract with concentrations of 3%, 7%, and 10% formulated asface mist formulation showed great potential inincreasing moisture in facial skin. However, based on research by Putra Riswana et al. (2022), concentrations of 3%, 7%, and 10% have a low and medium potential in inhibiting bacterial growth, therefore in this study the concentration of moringa leaf extract was increased to 25%, 35%, and 45%. Thus, this study aims to further explore the antiacne and antibacterial effectiveness of moringa leaf extract face mist formulations, especially against Propionibacterium acnes, as well as Staphylococcus epidermidis, Staphylococcus aureus, and Escherichia coli.

METHOD

Sample Characterization

Characterization was carried out at the Biology Education Study Program, Faculty of Teacher Training and Education, Galuh University, Ciamis Regency. Sample is Moringa leafs characterization is carried out with the aim of knowing the truth of the plant to be studied and avoiding errors in collecting materials.

Sample Collection

Moringa leaf was obtained from the Pintu Singa neighborhood, Banjar City, West Java. The sample was weighed up to 4000 g. At the initial stage, washing was carried out using running water to clean the sample from the dirt attached. Furthermore, it was dried by drying in the sun and covered with a black cloth. The dried leafwas pulverized using a blender to facilitate the extraction process.

Extraction Process

The extraction method used was maceration, and this was carried out with 96% ethanol solvent having a Moringa leaf powder and 96% ethanol ratio of 1:5. The sample was soaked using a polar solvent

and then filtered after 48 hours at room temperature.

Face Mist Formulation

Table 1. Face Mist Formulation

Ingredients	Functions	Ingredient Formulation (%)			
		I	II	III	IV
Moringa leaf extract	Active substance	0	25	35	45
Glycerin	Humectant	5	5	5	5
Phenoxyethanol	Preservative	0.5	0.5	0.5	0.5
Aquadest	Solvent	Add 100 mL	Add 100 mL	Add 100 mL	Add 100 mL

Face mist formulation was made in four formulas. The formulation was carried out by different Moringa leaf extract concentration, namely 0%, 25%, 35%, and 45%, denoted as Formulas I, II, III, and IV, respectively (Table 1). Each ingredient was weighed first according to the calculation and leaf extract was mixed with phenoxyethanol in a beaker glass (mixture 1). In another beaker glass, glycerin was mixed with distilled water gradually until homogeneous (mixture 2). Both mixtures were then mixed and the remaining distilled water was added to the limit of 100 mL and stirred. The homogeneous mixture was filtered using filter paper and placed into a calibrated bottle.

Instrument

The materials used in this study were moringa leaf, 96% ethanol, distilled water, glycerin, and phenoxyethanol. And the tools used included a glass chamber, hotplate, porcelain cup, plastic wrap, cotton, filter paper, pH meter, Brookfield viscometer, autoclave, Laminar Air Flow (LAF), and incubator.

Methods Describe the tools and materials used in the research.

Data analysis

Physical Evaluation of Face Mist Formulation, Antiacne and Antibacterial Effectiveness Test.

RESULTS AND DISCUSSION

a. Extraction of Moringa Leaf

Moringa leaf simplicia powder had a light green color with a distinctive aroma, while thick the extract had a characteristic blackish-brown color with a characteristic aroma. The yield of moringa leaf extract showed a value of 11% as presented in Table 2.

Table 2. Moringa Leaf Extract Result

Description		Result	Requirements
Moringa leaf extract	Simplisia weight	1000 gram	Not less than 9%
	Extract weight	110 gram	
	Yield	11%	
Moisture content		8.33%	Less than 10%
Ash content		8.66%	Less than 9%

The water content in the extract was tested to provide a minimum limit or range to prevent being overgrown with microorganisms and extend the shelf life (Lisi, A. K. F, Runtuwene, M. R. J and Wewengkang, D. S 2017). Based on the results, the water content was 8.33, which met the requirement of less than 10%. This wasin line with Wulandari et all. (2020) stating that the requirement for the water content of Moringa leaf extract wasless than 10% (Wulandari, A, Farida, Y and Taurhesia, S 2020).

The ash content testing aimed to provide an overview of the internal and external mineral content derived from the initial process up to whenthe extract was formed. Heating caused organic compounds and their derivatives to decay and evaporate, leaving mineral and inorganic elements. The ash content obtained was 8.66, which met the requirement of less than 9.0% (Wulandari, A, Farida, Y and Taurhesia, S 2020).

b. Physical Evaluation of Face Mist

The physical evaluation for face mist formulation consisted of organoleptic, homogeneity, pH, viscosity, and spray pattern tests. The results met the requirements as shown in Table 3.

Table 3. Results of Organoleptic and Homogeneity Tests

Evaluation Test	Formula	Inspection Result
Organoleptic	I	Liquid, clear with typical glycerin odor
	II	Liquid, dark brown in color with the characteristic odor of Moringa leaf
	III	Liquid, dark brown in color with the characteristic odor of Moringa leaf
	IV	Liquid, very dark brown in color with the characteristic odor of Moringa leaf
Homogeneity	I	Homogeneous
	II	Homogeneous
	III	Homogeneous
	IV	Homogeneous

Description:
I = Moringa Leaf Extract Face Mist Formulation 0%
II = Moringa Leaf Extract Face Mist Formulation 25%
III = Moringa Leaf Extract Face Mist Formulation 35%
IV = Moringa Leaf Extract Face Mist Formulation 45%

1. Organoleptic Test

Organoleptic tests need to be carried out because it is necessary to see how the final result of the physical appearance of each preparation made from several combinations of ingredients. Organoleptic testing is an important component in the quality assurance of a consumer-orientated cosmetic product. through this test manufacturers can ensure that the product is not only safe and effective but also pleasant to use, thus fulfilling consumer expectations. The results of the organoleptic test showed that the higher the leaf extract formulation, the greater the color intensity. This was evident in Formula IV which had a darker color than Formulas II and III. Meanwhile, Formula I showed a clear color because it did not contain moringa leaf extract.

2. Homogeneity Test

In the process of making face mist formulation, all ingredients were evenly mixed, ensuring the even distribution and dissolution of leaf extract. Based on the data in Table 3, it was concluded that the four formulas met the homogeneity test requirements. Examination using a microscope showed homogeneous and evenly distributed particles in the formulation. The formulation was considered to be homogeneous when there were no particles or the formation of clumps (Anindhita, M.A & Oktaviani, N. 2020)

Table 4. Results of pH, Viscosity and Spray Pattern Tests

Evaluation Test	Formula	Inspection result	$\bar{x}$ ± SD	P-Value
pH	I	5.25	5.286 ±0.032	0.104
		5.30		
		5.31		
	II	5.28	5.233±0.056	
		5.17		
		5.25		
	III	5.32	5.303±0.015	
		5.30		
		5.29		

	IV	5.31 5.29 5.37	5.323±0.041	
Viscosity	I	2.0 3.6	3.066 ± 0.092	0.001
	II	3.6 5.0 4.8	4.600± 0.529	
	III	4.0 5.5 5.5	5.366± 0.321	
	IV	5.6 6.0 5.7 5.9	5.866± 0.152	
Spray Pattern	I	-	0.038± 0.012	0.096
	II		0.049 ± 0.01	
	III		0.058 ± 0.014	
	IV		0.066 ± 0.014	

Description:
I = Moringa Leaf Extract Face Mist Formulation 0%
II = Moringa Leaf Extract Face Mist Formulation 25%
III = Moringa Leaf Extract Face Mist Formulation 35%
IV = Moringa Leaf Extract Face Mist Formulation 45%

3. pH Test

The pH test is carried out with the aim of knowing the safety of face mist preparations when used. If the pH of the preparation is too acidic will cause skin irritation, and if the pH of the preparation is too alkaline, it will cause dry skin result in dry skin. The pH values for Formulas I, II, III, and IV were 5.286 ± 0.032, 5.233 ± 0.056, 5.303 ± 0.015, and 5.323 ± 0.041, respectively. Based on the data, it was concluded that the four formulas met the pH test requirement of 4.5 – 8 (Indriastuti, M, et al. 2023). The statistical tests showed a significant value of 0.104 (p>0.05), meaning that leaf extract formulation did not significantly affect the pH value.

4. Viscosity Test

The viscosity test aims to determine the viscosity of the face mist preparation. Viscosity is very important for face mist preparations because it will affect the spread of the preparation when sprayed. if the viscosity of the fluid is large, the more difficult it is for a fluid to flow, and also indicates the more difficult it is for an object to move in the fluid. The results showed that the greater the leaf extract formulation, the greater the viscosity level. The statistical tests yielded a significant value of 0.001 (p <0.05), meaning that leaf extract formulation had a significant effect on the viscosity of the four formulas. A good viscosity value in spray preparations is less than 150 cP. The test results showed that Formula II met the viscosity requirements, while in Formulas III and IV, the value was above 5 mPas due to the higher leaf extract. To address this, Formulas III and IV can be homogenized by shaking before use. Spraying pattern tests were further carried out to determine the distribution pattern of the formulation when applied to the topical area.

5. Spraying Pattern Test

The spraying pattern test is crucial for evaluating the sprayer quality used (Anindhita, M.A & Oktaviani, N. 2020). The results showed that the four formulas produced a diffuse spraying pattern. This met the requirements of

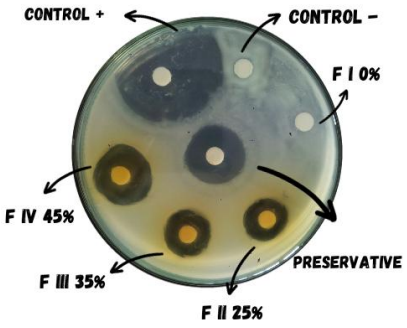
good spraying pattern criteria (Anindhita, M.A & Oktaviani, N. 2020).

The results indicated that the greater the leaf extract formulation, the higher the value of the delivery weight. The statistical tests showed a significant value of 0.096 ($p>0.05$), meaning that leaf extract formulation did not significantly affect the spraying pattern test. This implied that the applicators used in all formulations delivered reproducible amounts of each spray. This consistency is crucial for effective topical application and ensures the antiacne and antibacterial benefits are maximized by producing a consistent distribution pattern.

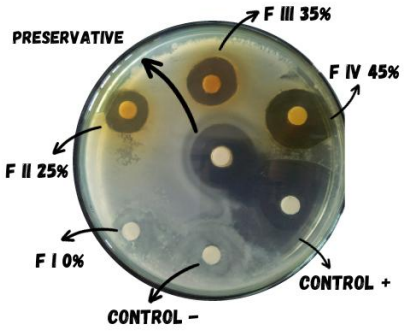
c. Antiacne and Antibacterial Effectiveness Tests

Antiacne and antibacterial effectiveness tests aimed to determine the ability of Moringa leaf extract face mist formulation to inhibit bacterial growth. The tests were carried out against Propionibacterium acnes, Staphylococcus epidermidis, Staphylococcus aureus, and Escherichia coli. Propionibacterium acnes, Staphylococcus epidermidis, Staphylococcus aureus, and Escherichia coli exhibit similar characteristics. These bacteria are commonly found on the skin and play an important role in the skin microflora. Propionibacterium acnes is a common anaerobic skin bacterium associated with acne, as are Staphylococcus epidermidis and Staphylococcus aureus. All of these bacteria have been extensively studied for their biochemical characteristics, culture features, and molecular identification methods. They exhibit various pathogenic potential. Despite of their pathogenicity, these bacteria remain vital components of the skin microbiome, which causes a wide range of skin problems and diseases. Formula IV had the largest inhibition zone diameter characterized by a clear zone formed around the disc paper as shown in Figure 1. The results of measuring the inhibition zone diameter of Moringa Leaf Extract Face Mist Formulation are shown in Table 5.

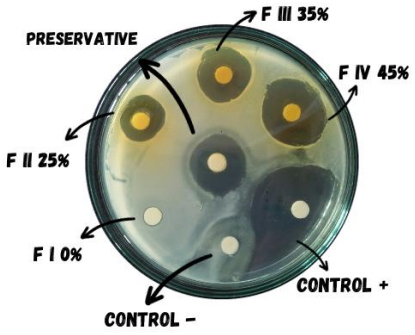
(a)



(b)



(c)



(d)

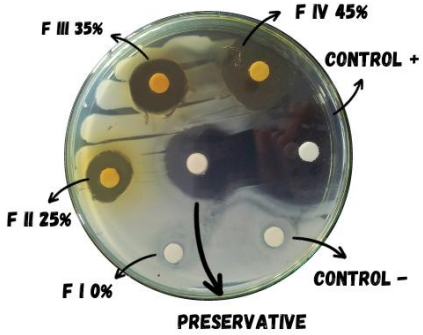


Figure 1. Antiacne and antibacterial effectiveness test of Moringa leaf extract face mist formulation against bacteria; (a) Propionibacterium acnes, (b) Staphylococcus epidermidis, (c) Staphylococcus aureus, and (d) Escherichia coli.

Table 5. Measurement Results of Inhibition Zone Diameter of Moringa Leaf Extract Face Mist Formulation

Bacterial Species	Treatment	Inhibition Zone Diameter (mm)			$\bar{x}$ ± SD	Classification	P-Value
		1	2	3			
P. acnes	C+	50	40	43	44.33± 5.132	Strong	0.000
	C-	-	-	-	0.000± 0.000	None	
	P	25	21	22	22.66± 2.082	Strong	
	I	-	-	-	0.000± 0.000	None	
	II	18	18	19	18.33± 0.577	Medium	
	III	23	21	22	22.00± 1.000	Strong	
	IV	29	27	26	27.33± 1.528	Strong	
S. epidermidis	C+	30	29	29	29.33± 0.577	Strong	0.000
	C-	-	-	-	0.000± 0.000	None	
	P	21	23	25	23.00± 2.000	Strong	
	I	-	-	-	0.000± 0.000	None	
	II	15	17	17	16.33± 1.155	Medium	
	III	18	19	19	18.66± 0.577	Medium	
	IV	20	25	21	2.00 ± 2.646	Strong	
S. aureus	C+	32	35	33	33.33 ±1.528	Strong	0.000
	C-	-	-	-	0.000± 0.000	None	
	P	21	24	22	22.33± 1.528	Strong	
	I	-	-	-	0.000± 0.000	None	
	II	16	17	17	16.66± 0.577	Medium	
	III	19	20	19	19.33± 0.577	Medium	
	IV	28	25	27	26.66 ±1.528	Strong	
E. coli	C+	40	50	48	47.66±2.517	Strong	0.000
	C-	-	-	-	0.000± 0.000	None	
	P	30	27	28	28.33± 1.528	Strong	
	I	-	-	-	0.000± 0.000	None	
	II	17	17	18	17.33± 0.577	Medium	
	III	18	20	19	19.00± 1.000	Medium	
	IV	25	24	24	24.33±0.577	Strong	

Description:
C+ = Clindamycin 1%
C- = Ethanol 96%
P = Phenoxyethanol 0.5%
I = Moringa Leaf Extract Face Mist Formulation 0%
II = Moringa Leaf Extract Face Mist Formulation 25%
III = Moringa Leaf Extract Face Mist Formulation 35%
IV = Moringa Leaf Extract Face Mist Formulation 45%

Based on the classification of the inhibition zone diameter, Formula II had moderate antiacne and antibacterial power with a diameter of 18.33 ± 0.577 mm for Propionibacterium acnes. Meanwhile, Formulas III and IV had a diameter of 22.00 ± 1.000 mm and 27.33 ± 1.528 mm, respectively. These formulas were both classified as having strong antiacne and antibacterial properties.

In *Staphylococcus epidermidis*, Formulas II and III with a diameter of 16.33 ± 1.155 mm and 18.66 ± 0.577 mm respectively had moderate antiacne and antibacterial power capabilities. Meanwhile, Formula IV had strong power with a diameter of 22.00 ± 2.646 mm.

For *Staphylococcus aureus*, Formulas II and III with a diameter of 16.66 ± 1.155 mm and 19.33 ± 0.577 mm had moderate antiacne and antibacterial power

capabilities. On the other hand, Formula IV had strong power with a diameter of 26.66 ± 1.528 mm.

In Escherichia coli, Formulas II and III with a diameter of 17.33 ± 0.577 mm and 19.00 ± 1.000 mm had moderate antiacne and antibacterial power. Meanwhile, Formula IV had strong power with a diameter of 24.33 ± 0.577 mm.

However, based on the diameter of the inhibition zone, when compared to phenoxyethanol, Formula IV had a greater average inhibition on the growth of Propionibacterium acnes at 27.33 ± 1.528 mm. This was because although phenoxyethanol possesses broad-spectrum antimicrobial abilities that could inhibit gram-positive and negative bacteria, it had a weaker effect on normal skin bacteria (Dréno, B, et al. 2019).

The difference in the diameter of the inhibition zone was due to leaf extract formulation, the higher the formulation, the wider the inhibition zone formed. According to a previous study, the antibacterial active compounds in Moringa leaf affected the inhibition produced (Wulandari, A, Farida, Y and Taurhesia, S 2020).

Moringa leaf contains flavonoid secondary metabolite compounds that play a role in damaging bacterial cell membranes in the phospholipid section, reducing permeability. Phenolic compounds can change the composition of membrane phospholipids, resulting in bacteria cell swelling and lysis (Putra Riswana, A, et al. n.d)

The negative control used was 96% ethanol and no inhibition zone was formed around the disc paper. This indicated that the negative control had no effect as antiacne and antibacterial. Similarly, Formula I formed no inhibition zone because it did not contain Moringa leaf extract. Testing was also carried out on phenoxyethanol preservatives as a negative control to ensure that the inhibition produced was truly from leaf extract. The test results showed inhibition of bacterial growth. This is because phenoxyethanol has broad-spectrum antimicrobial abilities that can inhibit gram-positive and negative bacteria. The maximum formulation of phenoxyethanol that can be used as a preservative in cosmetic formulation is 1% (Dréno, B, et al. 2019).

For the positive control, Klindamycin 1%, had a larger inhibition zone than leaf extract face mist formulation. This shows that clindamycin contains very strong antibacterials. It is a semisynthetic antibiotic derived from lincomycin and commonly used for the treatment of various bacteria diseases by stopping their proliferation (Athaillah and Sugesti 2020). Clindamycin has high activity, particularly against facultative anaerobic bacteria. It works by inhibiting protein synthesis in the 50S ribosomal subunit of bacteria, thereby disrupting the process of peptide chain formation (Athaillah and Sugesti 2020).

Tabel 6. Post Hoc Test Analysis

Bacterial Species	Treatment	K+	K-	P	I	II	III	IV
P. acnes	K+	-	0.000	0.000	0.000	0.000	0.000	0.000
	K-	0.000	-	0.000	1.000	0.000	0.000	0.000
	P	0.000	0.000	-	0.000	0.269	1.000	0.204
	I	0.000	1.000	0.000	-	0.000	0.000	0.000
	II	0.000	0.000	0.269	0.000	-	0.440	0.003
	III	0.000	0.000	1.000	0.000	0.440	-	0.112
	IV	0.000	0.000	0.204	0.000	0.003	0.112	-
S. epidermidis	K+	-	0.000	0.001	0.000	0.000	0.000	0.000
	K-	0.000	-	0.000	1.000	0.000	0.000	0.000
	P	0.001	0.000	-	0.000	0.001	0.021	0.667
	I	0.000	1.000	0.000	-	0.000	0.000	0.000
	II	0.000	0.000	0.001	0.000	-	0.404	0.002

	III	0.000	0.000	0.021	0.000	0.404	-	0.104
	IV	0.000	0.000	0.667	0.000	0.002	0.104	-
S. aureus	K+	-	0.000	0.000	0.000	0.000	0.000	0.000
	K-	0.000	-	0.000	1.000	0.000	0.000	0.000
	P	0.001	0.000	-	0.000	0.001	0.042	0.003
	I	0.000	1.000	0.000	-	0.000	0.000	0.000
	II	0.000	0.000	0.000	0.000	-	0.084	0.000
	III	0.000	0.000	0.042	0.000	0.084	-	0.000
	IV	0.000	0.000	0.003	0.000	0.000	0.000	-
E. coli	K+	-	0.000	0.000	0.000	0.000	0.000	0.000
	K-	0.000	-	0.000	1.000	0.000	0.000	0.000
	P	0.001	0.000	-	0.000	0.001	0.000	0.016
	I	0.000	1.000	0.000	-	0.000	0.000	0.000
	II	0.000	0.000	0.000	0.000	-	0.638	0.000
	III	0.000	0.000	0.000	0.000	0.638	-	0.001
	IV	0.000	0.000	0.016	0.000	0.000	0.001	-

Description:
K+ = Clindamycin 1%
K- = Ethanol 96%
P = Phenoxyethanol 0,5%
I = Moringa Leaf Extract Face Mist Formulation 0%
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IV = Moringa Leaf Extract Face Mist Formulation 45%

Data analysis was carried out with the OneWay ANOVA test to determine the average diameter of antiacne and antibacterial inhibition zones produced by Formulas II, III, and IV against Formula I, as well as positive and negative controls. The results showed a significant value ($p<0.05$), meaning that various formulations differed in terms of the effects compared to Formula I, positive, and negative controls.

Turkey test was conducted to determine the difference in the significant value of Moringa leaf extract face mist formulation against each bacteria. Based on the statistical results, Formula IV had a significant value ($p <0.05$) compared to the 1% clindamycin positive control.

There was a significant difference between Formula IV and phenoxyethanol, with a value of 0.003 ($p<0.05$) for Staphylococcus aureus and 0.016 ($p<0.05$) for Escherichia coli. This disparity was attributed to the flavonoid metabolite compounds in Moringa leaf that play a role in damaging bacteria cell membranes. In addition, Formula IV had a greater inhibitory power than phenoxyethanol.

In Propionibacterium acnes and Staphylococcus epidermidis, significant values of 0.204 ($p>0.05$) and 0.667 ($p>0.05$) were obtained, indicating that there was no significant difference between Formula IV and phenoxyethanol. This is because Formula IV and phenoxyethanol have antibacterial ability, but although phenoxyethanol has broad-spectrum antimicrobial ability that can inhibit gram-positive and negative bacteria, it has a weaker effect on normal skin bacteria (Dréno, B, et al. 2019).

The T-test analysis between phenoxyethanol and Formula IV showed no significant difference for Propionibacterium acnes, Staphylococcus aureus, and Escherichia coli with values of 0.468, 0.252, and 0.051 ($p>0.05$) respectively. However, there was a significant difference for Staphylococcus epidermidis as indicated by a p-value of 0.037 ($p<0.05$). The difference may be attributed to the interference of the compounds in the formulation with bacteria cells. Staphylococcus epidermidis is a gram-positivebacteria with a cell wall structure having more peptidoglycan, less lipids, and polysaccharides (teichoic acid).

Teichoic acid is a water-soluble polymer, which functions as a positive ion transport. This water-soluble property makes the cell wall of gram-positive bacteria more permeable to polar bioactive compounds (Fernanda Desmak Pertiwi, Firman Rezaldi and Ranny Puspitasari 2022)

According to Langsrud et al. (2016), phenoxyethanol can interfere with energy metabolism through proton leakage, decreased ATP levels, and inhibition of malate dehydrogenase. It also affects RNA as well as DNA synthesis and acts on several mechanisms in the cell depending on the formulation used (Langsrud, S, et al. 2016)

The main compound content that is efficacious as an antibacterial in moringa leaf extract is quercetin. Quercetin is a class of flavonol compounds that have an antibacterial mechanism of action by inhibiting peptidoglycan synthesis which results in damage to bacterial morphology, inhibiting β-lactamase activity, inhibiting fatty acid synthesis, but increasing protein amides I and II in bacterial cells. Moringa leaf ethanol extract also has anti-inflammatory effects by reducing udem followed by analysis of COX-2 expression through observation of neutrophil cells and can be utilized as an alternative acne treatment (Wulandari, A, Farida, Y and Taurhesia, S 2020).

Based on the discussion above, Moringa leaf extract is tested to have antibacterial activity so that it is proven to inhibit the growth of bacteria that cause acne. Moringa leaf extract is expected to have a positive impact on society by using moringa leaves as a natural antibacterial in overcoming bacterial infections that cause acne. In addition, the use of moringa leaf extract can also be used as a face mask material that is considered economical, at a low price, and easily available to all people.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the face mist formulation successfully met the physical evaluation requirements. Formula IV had strong antiacne and antibacterial effectiveness against all test bacteria, while Formula III was very effective against *Propionibacterium acnes*. Formula II and III had moderate inhibition ability on *Staphylococcus epidermidis, Staphylococcus aureus, and Escherichia coli.*

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