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Article

Antibacterial Activity of Solid Soap – Based Parijoto (*Medinilla speciosa* Blume) Fruit Extract Against *Propionibacterium acnes*

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Abstract: The prevalence of acne caused by Propionibacterium acnes is quite high. Parijoto fruit (*Medinilla speciosa* Blume) contains flavonoids, tannins, and saponins, all of which have antibacterial properties, making it a promising candidate for developing antibacterial solid soap. This study aimed to analyze the antibacterial activity and assess the physical stability of solid soap made from Parijoto fruit extract. The experiment used the disc diffusion method to test against Propionibacterium acnes, with five treatment groups. The positive control was JF Sulfur soap, the negative control was a soap base, formula I (0.5%), formula II (1%), and formula III (1.5%). The presence of an inhibition zone around the disc indicated antibacterial activity. The physical stability of the solid soap made from Parijoto fruit extract was evaluated through organoleptic testing, homogeneity, pH, moisture content, and foam height. The stability test showed that the soap's physical properties remained consistent after 5 cycles of testing. Regarding the antibacterial activity, the negative control exhibited no antibacterial effect, whereas strong antibacterial activity was observed at concentrations of 0.5%, 1%, and 1.5%. The inhibition zone diameters for Formula I, Formula II, and Formula III were 10.18 mm, 15.08 mm, and 15.85 mm, respectively. All formulas showed strong antibacterial activity, with Formula III having a significantly larger inhibition zone than the positive control. In conclusion, Parijoto extract soap demonstrated good physical stability and strong antibacterial effects against *Propionibacterium acnes*.

Keywords: Antibacteria, *Medinilla speciosa* Blume, *Propionibacterium acnes*, solid soap

1. Introduction

Skin health constitutes a fundamental component of overall well-being, as it not only supports physiological protection but also significantly affects physical appearance and self-confidence. The skin functions as the body's primary barrier against environmental stressors, pathogens, and chemical exposure. When proper hygiene practices are neglected, the accumulation of sweat, sebum, dead skin cells, and microorganisms can create a favorable environment for bacterial proliferation, thereby increasing the risk of cutaneous infections(1).

One of the most common dermatological conditions associated with impaired skin hygiene is acne vulgaris. This disorder develops primarily due to obstruction of pilosebaceous units, which occurs when excessive sebum production combines with keratinized cells to block sebaceous follicles(2). The blockage facilitates colonization by bacteria such as *Propionibacterium acnes*, triggering inflammatory responses that exacerbate lesion formation, including papules, pustules, and nodules. The prevalence of acne vulgaris is particularly high among adolescents, with reported incidence rates ranging from 47% to 90%, largely influenced by hormonal fluctuations during puberty(3).

However, the condition may also persist into adulthood, affecting both physical comfort and psychosocial well-being.

Preventive strategies play a crucial role in mitigating the development and severity of acne. Among these measures, the use of properly formulated cleansing products, especially antibacterial or medicated soaps, serves as a fundamental approach[4]. Effective soap formulations help remove excess sebum, debris, and microorganisms from the skin surface while maintaining the integrity of the skin barrier. Therefore, the development and evaluation of safe, efficacious, and skin-compatible soap products represent an important avenue in supporting dermatological health and preventing acne-related complications[5].

Organic bar soaps represent a promising alternative for antibacterial skin protection, as they effectively cleanse the skin while minimizing the risk of allergic reactions and irritation, particularly among individuals with sensitive skin[6]. In comparison with liquid soaps and other cleansing formulations, bar soaps provide several distinct advantages, including a lower environmental impact due to their biodegradable residues and reduced packaging waste. Additionally, bar soaps can function as mild natural exfoliants, helping to remove accumulated impurities and dead skin cells from the skin surface. Their adaptability in terms of shape, fragrance, and formulation further enhances their appeal to diverse consumer preferences and dermatological needs[6-7].

Among herbal plants and natural extracts with established antibacterial efficacy, the parijoto fruit (*Medinilla speciosa*) stands out. Phytochemical analyses confirm the presence of bioactive compounds such as flavonoids, tannins, and saponins[8]. Empirical evidence further substantiates its antibacterial potency against *Propionibacterium acnes*, the principal etiologic agent in acne pathogenesis[4,9]. These attributes position parijoto fruit extract as an ideal candidate for incorporation into antibacterial soap bases. The present experimental investigation focuses on developing a bar soap formulation enriched with parijoto fruit extract to harness its antibacterial properties. In light of these findings, conducting comprehensive research on the safety, performance, and eco-friendly potential of parijoto fruit–derived antibacterial bar soap is both appropriate and urgently needed.

2. Materials and Methods

This study used a laboratory experimental research design, formulating solid soap from parijoto fruit extract, which was tested for antibacterial activity and then examined for its inhibition zone diameter against *Propionibacterium acnes* bacteria. This study used the disc diffusion method.

Materials and Instrument

Instruments

The instruments used in this study were an autoclave (Memmert), oven (Memmert), incubator (Ecocell MMM Group), water flow laminar, water bath (Nesco Lab), microscope, silicone soap mold, pH paper, caliper, petri dish (Pyrex/Iwaki), ose, micropipette, and vacuum rotary evaporator.

Materials

The materials used in this study were parijoto fruit, VCO 31.70% (Trivico Virgin Coconut Oil), Palm Oil 31.72% (SunCo), Olive Oil 26.57% (Pomace Olive Oil Mueloliva),

P*ropionibacterium acnes*, paper discs with a diameter of ± 6 mm, Nutrient Agar (NA), NaOH, 70% ethanol, and distilled water.

Research Procedure

Extraction

The simplicia was prepared using the maceration method by adding 70% ethanol solvent to the crushed parijoto fruit simplicia. The parijoto fruit simplisia was macerated using 70% ethanol at a ratio of 1:10, then macerated for 3 days. The filtrate obtained was then concentrated with rotary evaporator at temperature of 60°C until a thick extract was obtained[10].

Moisture content test and Solvent test

The test was carried out by drying a porcelain dish in an oven at 105°C for 1 hour and weighing the empty porcelain dish, then weighing 2 grams of extract and heating it in an oven for 3 hours at 105°C. The sample was then cooled in a desiccator for 20 minutes and weighed. Meanwhile, for the ethanol-free test, the parijoto fruit extract was reacted with 2 mL of potassium dichromate in an acidic environment with the addition of 3 drops of concentrated sulfuric acid. The solution is considered to contain ethanol if it turns blue when reacted[11].

Phytochemical screening

The flavonoid test was carried out by adding the extract to magnesium powder and 1 mL of HCl. The tannin test was performed by adding $FeCl_3$ solution to the extract, and the saponin test was performed by adding 4 drops of HCl to the extract[12].

Preparation of parijoto fruit extract solid soap

The main ingredients of parijoto fruit ethanol extract, VCO, palm oil, olive oil, NaOH, 70% ethanol, and distilled water were prepared and weighed according to the formula in **Table 1**. Next, VCO, palm oil, and olive oil were mixed in three formulas (I, II, III) and stirred until homogeneous using an ultra-turax. Then, NaOH was added to the oil mixture and stirred until a trace formed through saponification reaction. The next step was to add the parijoto fruit extract according to the concentration and stir until homogeneous. The mixture was poured into silicone molds and left for 1-2 days at room temperature until it hardened.

Table. 1. Formulation of parijoto extract solid soap

Ingredients	Conc.	Formula I	Formula II	Fomula III
Parijoto extract	g	0,50	1,00	1,50
VCO	mL	31,70	31,70	31,70
Palm Oil	mL	31,72	31,72	31,72
Olive Oil	mL	26,57	26,57	26,57
NaOH	g	9,00	9,00	9,00
Aquades	mL	add 10	add 10	add 10

Note
Formula 1 : parijoto extract 0,5 g weight
Formula 2 : parijoto extract 1,0 g weight
Formula 3 :parijoto extract 1,5 g weight

Physical stability test

Accelerated stability testing using the cycling test method. Soap samples will be stored at a temperature of ±4°C for 24 hours and ±40°C for 24 hours (1 cycle). Physical stability observations will be carried out at each cycle, with 5 cycles observed over 10 days[13].

Antibacterial activity

The antibacterial activity test was carried out by preparing sterile Petri dishes. Then, Nutrient Agar (NA) medium that had been liquefied was added. A diagram consisting of 5 parts was made on each Petri dish. The paper discs were then placed in the solid soap solution (Darsini et al., 2025). The discs were then placed on each part and incubated at a temperature of 37°C for 24 hours. The antibacterial test of parijoto fruit extract was repeated three times. The inhibition zones formed around the paper discs were then observed and measured to determine the diameter of the inhibition zones (Astutik et al., 2021; Guntur et al., 2021; Nasution et al., 2024).

Statistical analysis

Statistical analysis was performed using a one-way ANOVA analysis method, SPSS version 26 with a 95% confidence level (Lestari et al., 2020) and followed by an LSD (Least Significant Difference) test, which is a follow-up procedure aimed at determining which treatments were significantly different.

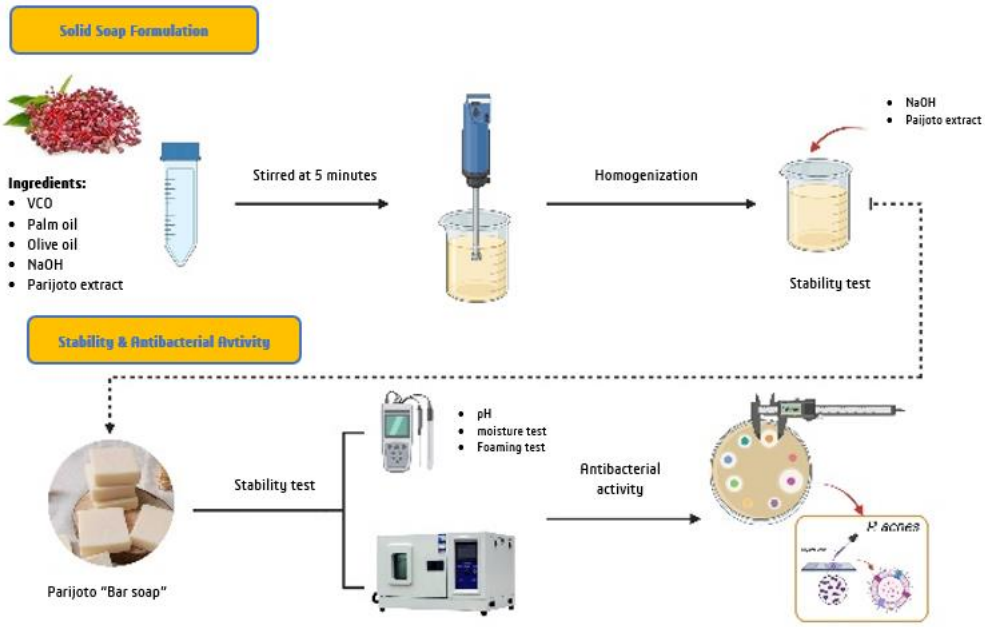

Figure 1. Scheme of soap bar formulation

3. Results

Yield of parijoto fruit extract

As shown in **Table 2**, the extraction process of parijoto fruit produced a yield of 11.53%. This result indicates that the recovery of the concentrated extract was considered optimal, as the percentage yield exceeded 10%, reflecting an efficient extraction process and satisfactory retrieval of the bioactive constituents[14-15].

Table 2. Formulation of parijoto extract solid soap

Powder weight (grams)	Extract weight (grams)	% yield	Characteristic		
			Shape	Color	Odor
352.42	40.65	11.53	Thick	Reddish brown	Distinctive smell

Phytochemical screening

The identification of secondary metabolites in the parijoto fruit extract was performed qualitatively using colorimetric tests. Based on the phytochemical screening results presented in **Table 3**, the extract showed positive reactions for the presence of flavonoids, tannins, and saponins, indicating that these bioactive compounds are contained within the extract.

Table. 3. Formulation of parijoto extract solid soap

Metabolite compound	Reagent	Result	Conclusions
Flavonoid	Mg powder and HCl	Yellow color	(+)
Tanin	$FeCl_3$	Dark blue color	(+)
Saponin	HCl	Stable foam	(+)

Organoleptic and homogeneity

The organoleptic and homogeneity results in **Table 4** show that the three solid soap formulas with varying extract concentrations are stable and homogeneous. Organoleptic testing was conducted by observing the solid soap preparations, including their color, smell, and shape. This organoleptic test aimed to determine the physical appearance of the parijoto fruit extract solid soap preparations by observing their color, odor, and shape. The physical quality of the solid soap was observed for 5 cycles using the cycling test method, in which soap samples were stored at ±4°C for 24 hours and ±40°C for 24 hours for each cycle.

Table 4. Formulation of parijoto extract solid soap

Parameter	Formula	Cycle to-						Concl.
		0	1	2	3	4	5	
Homogeinity	I	H	H	H	H	H	H	MS
	II	H	H	H	H	H	H	MS
	III	H	H	H	H	H	H	MS
Shape	I	PK	PK	PK	PK	PK	PK	MS
	II	PK	PK	PK	PK	PK	PK	MS
	III	PK	PK	PK	PK	PK	PK	MS
Color	I	P	P	P	P	P	P	MS
	II	CM	CM	CM	CM	CM	CM	MS
	III	CM	CM	CM	CM	CM	CM	MS
Odor	I	K	K	K	K	K	K	MS
	II	K	K	K	K	K	K	MS
	III	K	K	K	K	K	K	MS

Note
Formula 1 : parijoto extract 0,5 g weight
Formula 2 : parijoto extract 1,0 g weight
Formula 3 :parijoto extract 1,5 g weight

Acidity (pH) test

The observations of the solid soap formulation over five stability cycles, as presented in **Figure 2**, revealed that the pH values consistently ranged from 9 to 10. This indicates that the produced soap met the pH requirements established by the Badan Standardisasi

Nasional (BSN), which specify an acceptable pH range of 8–11 for solid soap preparations. Therefore, the formulation can be considered compliant with the applicable national quality standards in terms of pH.

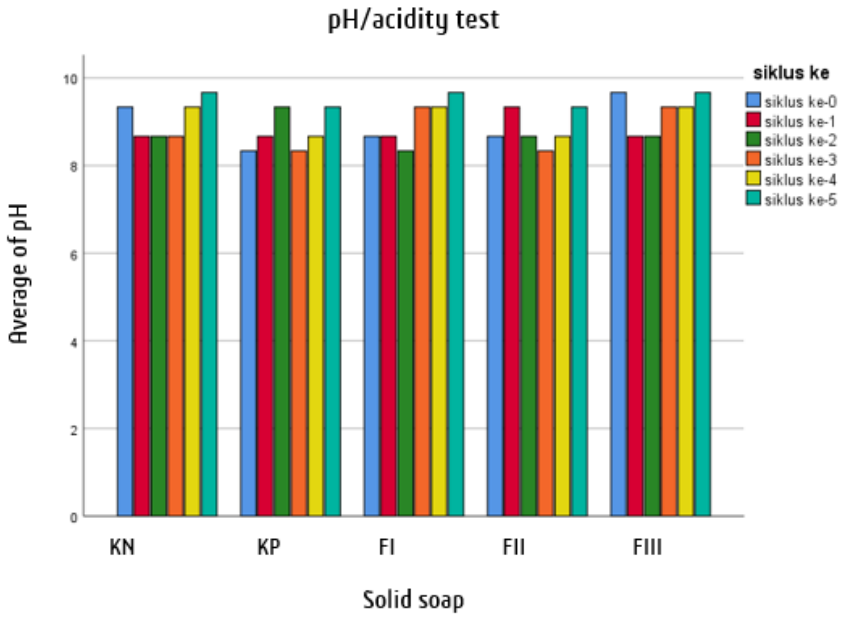

Figure 2. pH/acidity test of solid soap formulation

Moisture content test

Based on the moisture content analysis shown in **Figure 3**, the solid soap formulation exhibited consistent and stable water content throughout the observation period. The recorded moisture values did not show any significant changes during the stability assessment, including after completion of the cycling test. This consistency indicates that the formulation was able to maintain its physical integrity and was resistant to excessive moisture loss or absorption under varying storage conditions.

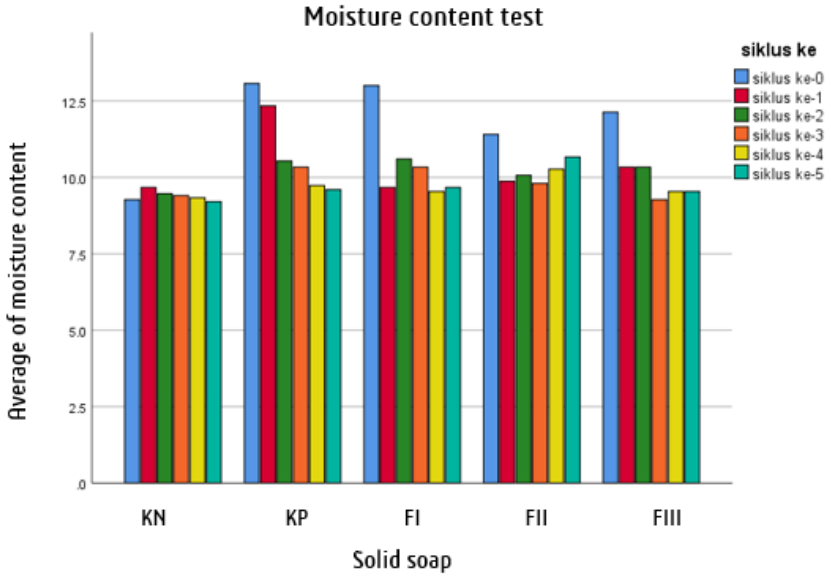

Figure 3. Moisture content test of solid soap formulation

Foam stability test

The results of the foam stability evaluation for each formulation and the comparative control, as presented in **Figure 4**, indicated that the percentage of foam height ranged from 87% to 98%. These values demonstrate that all tested formulations were able to produce and maintain foam effectively.

According to established standards, the acceptable foam height for solid soap preparations ranges from 13–220 mm or corresponds to a stability value of more than 60% (Hutauruk et al., 2020; Putra et al., 2024). Therefore, the foam stability results obtained in this study meet the ideal criteria, indicating that the formulated soaps possess good foaming ability and stability, which are important quality parameters influencing consumer acceptance and cleansing performance.

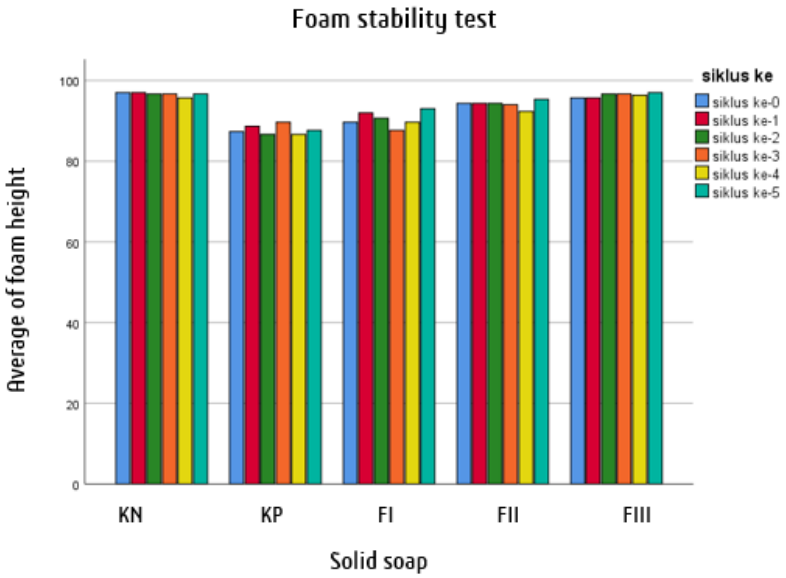

Figure 4. Foam stability test of solid soap formulation

Antibacterial activity

The antibacterial activity of the solid soap containing parijoto fruit extract was evaluated using the disc diffusion method with five treatment groups: a positive control (JF Sulphur solid soap), a negative control (soap base without extract), Formula I (0.5 g extract), Formula II (1 g extract), and Formula III (1.5 g extract).

The results demonstrated a concentration-dependent effect, where increasing the amount of parijoto fruit extract in the formulation led to a larger diameter of the inhibition zone. The antibacterial efficacy of the preparation was determined by measuring the clear zone formed around the disc, which indicates bacterial growth inhibition. As presented in **Table 5**, the average inhibition zone diameters for Formulas I, II, and III were 10.18 mm, 15.08 mm, and 15.85 mm, respectively. These findings confirm that higher extract concentrations enhanced the antibacterial activity of the solid soap formulation.

Table 5. Formulation of parijoto extract solid soap

Sample	Replicate	Diameter	Mean ±SD	Category
KP	1	14,56	14,25 ± 0,30	Strong
	2	14,23		
	3	13,96		
KN	1	0,00	0,00 ± 0,00	In active
	2	0,00		
	3	0,00		
FI	1	10,32	10,18 ± 0,20	Strong
	2	10,28		
	3	9,94		
FII	1	15,24	15,08 ± 0,19	Strong
	2	15,14		
	3	14,86		
FIII	1	16,12	15,85 ± 0,23	Strong
	2	15,66		
	3	15,78		

Note
Formula 1 : parijoto extract 0,5 g weight
Formula 2 : parijoto extract 1,0 g weight
Formula 3 :parijoto extract 1,5 g weight
KP : positive control (JF Sulphur)
KN : negative control (aquades)

4. Discussion

Yield of extraction

The preparation of parijoto fruit ethanol extract was carried out using the maceration method. The maceration method is a process for extracting saponin from saponin using a solvent and several rounds of stirring at room temperature. The purpose of maceration is to extract heat-resistant as well as heat-sensitive substances. Technologically, the maceration method is an extraction method based on the principle of achieving equilibrium concentration[15].

The extraction solvent used is 70% ethanol, which is polar and selective in extracting secondary metabolites in plants. Flavonoids and phenolic compounds in parijoto fruit are generally in the form of polar glycosides, so they must be dissolved with a polar solvent, and 70% ethanol is a polar solvent. Factors affecting the yield of the extract include the extraction method used, particle size, the ratio of the sample amount to the amount of solvent used, and the extraction time[16].

Metabolite Compound

A positive flavonoid reaction is characterized by the appearance of red, yellow, or orange coloration in the sample solution. The development of these colors in the test indicates that the parijoto fruit extract contains flavonoid compounds. Flavonoids are widely recognized as bioactive secondary metabolites, and numerous medicinal plants rich in flavonoids have been reported to exhibit various pharmacological activities, including

antibacterial, antioxidant, antiviral, anti-inflammatory, anti-allergic, immunomodulatory, and anticancer effects[17-18].

In the tannin assay, the presence of tannins is indicated by the formation of a blackish-green or dark blue coloration. Meanwhile, the detection of saponins in parijoto fruit extract is confirmed by the formation of stable foam that persists for approximately 10 minutes[19]. If the foam remains stable even after the addition of hydrochloric acid (HCl), it further confirms the presence of saponins. The formation of persistent foam is attributed to glycoside compounds, which possess surface-active properties and can produce foam in aqueous solutions. Upon the addition of HCl, hydrolysis occurs, breaking down the glycoside bonds into glucose and other components, thereby confirming the presence of saponin compounds[19].

Organoleptic properties and homogeneity

The process of making solid soap from parijoto fruit extract uses the saponification method. Saponification is the hydrolysis reaction of fatty acids by the presence of a strong base (e.g., NaOH). Saponification is a reaction between acid or fatty and base that produces soap and glycerol as by-products. The saponification reaction involves a base (caustic soda NaOH) that hydrolyzes triglycerides. These triglycerides can be fat esters that form carboxylate salts. Oil is the main ingredient in the saponification reaction[7].

This study used a combination of three types of oil, namely Virgin Coconut Oil (VCO), palm oil, and olive oil. Virgin Coconut Oil (VCO) was used because it is the type of oil richest in fatty acids that are beneficial for the skin. The most dominant fatty acid in VCO is lauric acid, which is needed in soap making because it provides excellent and gentle foaming for soap products[20], while Palm Oil is an oil with a relatively high content of palmitic acid ($C_{16}H_{32}O_2$), specifically 44.3%, which contributes to the hardness of the soap and produces good foam stability. Olive Oil is used in soap production because it has a high content of oleic acid, which is beneficial for the skin and provides moisture[21].

Physical Stability

Physical stability tests were conducted to evaluate the foam height, pH value, and water content produced by parijoto fruit extract solid soap. The pH test of parijoto fruit extract solid soap preparations aims to determine the acidity value and see the suitability of the pH of parijoto fruit extract solid soap with the pH standard of soap that affects skin irritation[22]. The acidity (pH) of the three soap preparation formulas did not differ significantly in each cycle. The T-Test results also showed a p-value>0.05, which means that there was no significant difference between all test groups between formulas in cycles 1–5. This shows that the parijoto fruit extract solid soap formulation has good physical stability in terms of pH stability. The pH stability between these formulas is due to NaOH as a base or alkali soap-forming agent being given at the same concentration and in accordance with the provisions, so that the resulting pH meets the requirements. NaOH plays a role in the saponification reaction by reacting with oil. When the reaction takes place, not all NaOH reacts completely with the oil, thereby affecting the degree of acidity in the soap[20].

Foam has a significant function in the skin-cleansing process and in facilitating the release of the soap's fragrance during use[23]. Therefore, foam height testing is an important quality control parameter to ensure that the soap formulation possesses adequate foaming capacity. This evaluation helps determine the product's ability to generate and maintain foam, which contributes not only to cleansing effectiveness but also to the optimal

dispersion of fragrance. The primary objective of foam testing is to assess the foaming power of solid soap. In this procedure, foam height is measured immediately after agitation and then remeasured after 5 minutes to evaluate foam stability over time.

The moisture content of solid soap is necessary to determine the amount of water in solid soap and also affects the efficiency of the soap during use. Based on the results of the soap moisture content, it is known that the moisture content value of the soap produced is still within the moisture content range required by SNI (1994) quality requirements, which stipulate that the moisture content limit in solid soap is a maximum of 15%. Therefore, based on the moisture content test, the soap produced is classified as having good stability[6].

Antibacterial activity

Antibacterial testing began with the identification of *Propionibacterium acnes* bacteria using Gram staining. The results of bacterial identification show that Propionibacterium acnes bacteria in Gram staining are resistant to Gram A. The bacteria will contain crystal violet during the Gram staining process. Gram-positive bacteria will appear purple when observed under a microscope, unlike Gram-negative bacteria, which will appear red because the purple colour will be washed away by binding with Gram D as a contrasting colour[24].

The antibacterial activity of parijoto fruit solid soap is influenced by the amount of extract used and the active compounds in parijoto fruit that act as antibacterials, namely flavonoids, tannins, and saponins. Flavonoids can inhibit bacterial growth by disrupting the double layer of the membrane and membrane proteins, changing the structure, flexibility, and permeability of the bacterial membrane[25]. Other polyphenol groups such as tannins are reported to have antibacterial activity through their ability to penetrate the bacterial cell wall to the internal membrane, disrupting cell metabolism and destroying bacterial cells. Tannins inhibit the attachment of bacteria to surfaces, causing bacterial cell death.

In addition, saponin compounds, whose structure consists of various hydrophilic glycon side chains and hydrophobic aglycone backbones, have a different antibacterial mechanism. The potential of saponins in preventing bacterial growth is proven to be due to their amphipathic nature as compounds that have hydrophobic and hydrophilic properties capable of penetrating the membrane of microorganisms into the cell, resulting in microbial death. The presence of these secondary metabolite compounds in parijoto fruit extract can provide synergy in its antibacterial activity against *Propionibacterium acnes*[9].

5. Conclusions

Solid soap formulations containing parijoto (*Medinilla speciosa*) fruit extract demonstrated satisfactory physical stability throughout evaluation. This was confirmed by organoleptic observations (color, odor, and texture), homogeneity assessment, pH measurement, moisture content determination, and foam height testing. After undergoing a five-cycle stability (cycling) test, no significant changes were observed in these parameters, indicating that the formulations remained physically stable under alternating storage conditions. The solid soap containing 1.5 g of parijoto fruit extract (Formula III) exhibited the highest inhibitory effect, with an average inhibition zone diameter of 15.85 mm. Based on standard antibacterial activity classifications, this result falls into the strong inhibition category. The antibacterial efficacy of the formulation is attributed to the presence of

bioactive secondary metabolites in the parijoto fruit extract, particularly flavonoids, tannins, and saponins. These compounds are known to exert antimicrobial effects through mechanisms such as disrupting bacterial cell walls and membranes, denaturing proteins, inhibiting essential enzymes, and interfering with microbial metabolic processes.

Author Contributions: Formulation and Stability assessment, GRM; Writing and Validation, RL; Editing and Visualization, NFJ; Antibacterial activity, AP; Data analysis, NNA; Project administration and review, WS.

References

1. Humphrey S, Manson Brown S, Cross SJ, Mehta R. Defining Skin Quality. *Dermatologic Surg*. 2021;Publish Ah(7):974–81.
2. Del Rosso JQ, Kircik L. The primary role of sebum in the pathophysiology of acne vulgaris and its therapeutic relevance in acne management. *J Dermatolog Treat*. 2024;35(1). Available from: https://doi.org/10.1080/09546634.2023.2296855
3. Lynn D, Umari T, Dellavalle R, Dunnick C. The epidemiology of acne vulgaris in late adolescence. *Adolesc Health Med Ther*. 2016;13. Available from: https://doi.org/10.2147/AHMT.S55832
4. Xu W, Xu J, Huang D, Wang C, Song J, Chen X, et al. Acne vulgaris: advances in pathogenesis and prevention strategies. *Eur J Clin Microbiol Infect Dis*. 2025;44(3):515–32. Available from: https://doi.org/10.1007/s10096-024-04984-8
5. Mishra M, Patel N, Pandya I, Patil R, Patel M. Evaluating the dermal safety and skin compatibility of personal care cosmetic products formulated with natural ingredients: An in-vivo primary irritation patch test study. *Dermatol Res Ski Care*. 2023;7(6):1–8. Available from: https://www.alliedacademies.org/journal-dermatology-research-skin-care/
6. Priyanka G. Ghonge, Pooja R. Hatwar, Prashant G. Shelke, Ravindra L. Bakal, Sanika S. Khandare. Herbal soaps in skincare: Natural solution for healthy skin. *GSC Biol Pharm Sci*. 2025;31(3):055–63.
7. Hidayat F, Rosanti AD, Fitria F, Risy A, Reza A. Formulation of Bar Soap Containing Neem and Sulfur as Active Ingredients and Antibacterial Testing Against Propionibacterium acnes. *FITOFARMAKA : Jurnal Ilmiah Farmasi*. 2025;15(2):96–103.
8. Vifta RL, Luhurningtyas FP. Fractionation of metabolite compound from Medinilla speciosa and their antioxidant activities using ABTS.+ radical cation assay. *Adv Sustain Sci Eng Technol*. 2019;1(1):1–10.
9. Sari DM, Zukhruf N, Khiromah W, Fitriyati L. Formulation of Anti-Acne Gel for Ganitri (*Elaeocarpus ganitrus* Roxb.) Leaves Ethanol Extract with Variations of HPMC as Gelling Agent. 2022;216–7.
10. Farida RN, Vifta RL, Erwiyani AR. Uji Aktivitas Antibakteri Ekstrak Buah Parijoto (*medinilla spesiosa* B.) Dengan Perbandingan Pelarut Etanol 70% Dan Etanol 96% Terhadap Bakteri Pseudomonas Aeruginosa. Indones *J Pharm Nat Prod*. 2021;4(1).
11. Astutik P, Yuswantina R, Vifta RL. Perbandingan aktivitas antifungi ekstrak etanol 70% dan 96% buah parijoto (*Medinilla speciosa*) terhadap *Candida albicans*. *Journal of Holistics and Health Science*. 2021;3(1):32-41.
12. Vifta RL, Advistasari YD. Skrining Fitokimia , Karakterisasi , dan Penentuan Kadar Flavonoid Total Ekstrak dan Fraksi-Fraksi Buah Parijoto (*Medinilla speciosa* B .). *Pros Semin Nas Unimus*. 2018;1:8–14.
13. Suryani, Putri AEP, Agustyiani P. Formulasi dan Uji Stabilitas Sediaan Gel Ekstrak Terpurifikasi Daun Paliasa (*Kleinhovia hospita* L.) yang Berefek Antioksidan. *Pharmacon J Ilm Farm*. 2017;6(3):157–69.

14. Damar Adi Prasetyo RLV. Pengaruh Metode Ekstraksi Terhadap Kadar Flavonoid Total Ekstrak Jahe Merah (*Zingber officinale* var Rubrum). Journl Holistics Helath Sci. 2022;4(1):192–201.
15. Sadeq O, Mechchate H, Es-Safi I, Bouhrim M, Jawhari FZ, Ouassou H, et al. Phytochemical screening, antioxidant and antibacterial activities of pollen extracts from micromeria fruticosa, achillea fragrantissima, and phoenix dactylifera. *Plants*. 2021;10(4).
16. Nawaz H, Shad MA, Rehman N, Andaleeb H, Ullah N. Effect of solvent polarity on extraction yield and antioxidant properties of phytochemicals from bean (*Phaseolus vulgaris*) seeds. *Brazilian J Pharm Sci*. 2020;56.
17. Hamidu L, Ahmad AR, Najib A. Qualitative and quantitative test of total flavonoid buni fruit (*Antidesma bunius* (L.) Spreng) with UV-Vis spectrophotometry method. *Pharmacogn J*. 2018;10(1):60–3.
18. Hanifa NI, Wirasisya DG, Muliani AE, Utami SB, Sunarwidhi AL. Phytochemical Screening of Decoction and Ethanolic Extract of *Amomum dealbatum* Roxb. Leaves. *J Biol Trop*. 2021;21(2):510–8.
19. Shaikh JR, Patil M. Qualitative tests for preliminary phytochemical screening: An overview. *Int J Chem Stud*. 2020;8(2):603–8.
20. Dwiputri, AS, Pratiwi L, Nurbaeti S. Optimasi Formula Sabun Organik Sebagai Scrub Kombinasi VCO, Palm Oil , Dan Olive Oil Menggunakan Metode Simplex Lattice Design. P*ortal J Ilm Univ Tanjungpura*. 2022;6(1):1–14. Available from: https://jurnal.untan.ac.id/index.php/jmfarmasi/article/view/56269
21. Aryani R, Lukmayani Y, Hazar S. Formulation and Antibacterial Activity of Transparent Solid Soap Combination of Secang Ethanolic Extract and Clove Bud Oil Against Skin Disease Bacteria. *KnE Life Sci*. 2022;2022:36–47.
22. Nazdrajic S, Bratovcic A, Alibegic D, Micijevic A, Mehovic M. The Effect of Mixed Surfactants on Viscosity, pH and Stability of Synthesized Liquid Soaps. *Int J Mater Chem*. 2024;2024(3):31–6. Available from: http://journal.sapub.org/ijmc
23. Roliand L.E, Paulina V.Y.Y, Elly J.S. Test For Antibacterial Activity Provision Of Liquid Soap Ethanol Extract Of Clove Leaves (*Syzygium aromaticum*) Againts Staphylococcus aureus Bacteria. *Pharmacon*. 2021;10:767–73.
24. Ahmed N, Karobari MI, Yousaf A, Mohamed RN, Arshad S, Basheer SN, et al. The Antimicrobial Efficacy Against Selective Oral Microbes, Antioxidant Activity and Preliminary Phytochemical Screening of Zingiber officinale. *Infect Drug Resist*. 2022;15(May):2773–85.
25. Shamsudin NF, Ahmed QU, Mahmood S, Shah SAA, Khatib A, Mukhtar S, *et al*. Antibacterial Effects of Flavonoids and Their Structure-Activity Relationship Study: A Comparative Interpretation. *Molecules*. 2022;27(4).