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Review Article: Methods Of Preparation And Ointment Bases Used In Ointment Preparations

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Abstract

Ointments, semi-solid topical preparations, are increasingly being developed with natural ingredients for wound healing and antibacterial effects amidst the challenges of antibiotic resistance in Indonesia. This study reviews herbal ointment formulations based on extraction techniques, manufacturing methods, bases, physical quality, and biological effectiveness. Using a descriptive qualitative literature study with narrative synthesis from national journals (2020-2025). The population was all related articles; a purposive sample of 40 articles based on completeness and quality. Instruments were scientific documents; thematic and descriptive clustering analysis. The results showed that ethanol extraction produced flavonoids and tannins; the melting/trituration method with a hydrocarbon/PEG base met standards (pH 4.5-7, spreadability 5-7 cm, adhesiveness >4 seconds), with antibacterial activity against Staphylococcus aureus. In conclusion, herbal ointments have the potential to be safe phytopharmaceuticals, requiring clinical validation.

Keywords: Antibacterial Activity, Herbal Ointment, Literature Review, Natural Extracts, Ointment Formulation.

INTRODUCTION

Ointments are semi-solid topical preparations widely used to provide protective and emollient effects and prolong drug contact on the skin, especially in the treatment of wounds, infections, and other dermatological conditions. In Indonesia, the development of herbal ointment research has increased significantly along with public interest in medicinal plants, with various studies showing the potential of natural active substances such as flavonoids and terpenoids in increasing the effectiveness of preparations.

The use of natural ingredients in ointments utilizes ethanol extraction to obtain secondary metabolites such as flavonoids, tannins, and alkaloids, which support antibacterial activity and wound healing. Various local plants such as hibiscus leaves and binahong have been formulated into ointments with physical properties that meet standards, including a pH of 4.5-7 and a spread of 5-7 cm.

The main problem in the development of herbal ointments is the instability of bioactive compounds due to oxidation, heat degradation, and interaction with the base, which causes a decrease in biological activity [Hernawan et al., 2020]. The selection of bases such as hydrocarbons or PEG often faces challenges in homogeneity and viscosity, where hydrocarbon bases excel in retention but lack optimal spreadability.

Manufacturing methods such as melting and trituration also affect quality, with the risk of thermal degradation of sensitive compounds if temperature is not controlled, requiring systematic optimization. Physical quality evaluations often show variation between formulations, where increasing extract concentration can decrease spreadability while increasing adhesion. Variation in biological effectiveness against bacteria such as Staphylococcus aureus is also an issue, with some formulations showing only weak inhibition without further clinical testing.

This study aims to review herbal ointment formulations based on extraction techniques, manufacturing methods, base types, and physical and biological qualities to identify optimal patterns. The urgency lies in the need for safe alternatives to address antibiotic resistance and dependence on synthetic drug imports in Indonesia. Its novelty presents a synthesis of 40 recent studies (2021-2025) with a comprehensive analysis, including recommendations for base and method optimization for topical phytopharmaceutical development.

RESEARCH METHODS

This research is a literature review that aims to examine the formulation of natural ointment preparations based on extraction techniques, manufacturing methods, base types, as well as physical quality and biological effectiveness from various related scientific articles. This type of research is descriptive qualitative with a narrative synthesis approach to summarize findings from primary literature, as explained by Sugiyono that the literature review method is effective for systematically integrating secondary data to build a comprehensive understanding of the topic. This approach is also in line with Sudaryono who emphasizes qualitative content analysis to identify patterns from reliable sources, as well as Emzir in educational research methodology who suggests literature reviews to analyze social phenomena such as the development of pharmaceutical preparations.

The research used a qualitative literature study with data collection methods through searching for scientific articles from national journals and proceedings published between 2020 and 2025, focusing on keywords such as "herbal ointment," "ointment formulation," "medicinal plant extracts," "antibacterial ointment," and "wound healing." This method adopted the literature review design according to Creswell, which involves identifying gaps in previous research, grouping themes such as manufacturing methods and ointment bases, and descriptive synthesis to conclude the potential for phytopharmaceutical development. Sugiyono added that this approach is inductive to build hypotheses from credible secondary data, while Sudaryono recommends triangulation of sources to increase validity.

The main instrument was a scientific article document selected based on inclusion criteria: containing data on natural active ingredients, ointment manufacturing methods, base types, physical quality test results (pH 4.5-7, spreadability 5-7 cm, adhesiveness >4 seconds), and biological tests such as antibacterial against Staphylococcus aureus. The data analysis technique was descriptive qualitative with thematic grouping (active ingredients, melting/trituration methods, hydrocarbon/absorption/PEG bases, and quality evaluation), followed by narrative synthesis to identify patterns such as the effectiveness of flavonoid and tannin ethanol extracts. Emzir explained this technique as a systematic qualitative content analysis for descriptive research, supported by Creswell in qualitative research design for categorization and theme building from the literature, and Sugiyono who suggested gradual secondary data reduction.

The population includes all scientific articles on herbal ointment formulations available in Indonesian national journal databases until 2025, with an estimated hundreds of publications related to medicinal plants such as binahong leaves, miana, and bay leaves. The sample consists of 40 articles purposively selected based on relevance, completeness of formulation data, and scientific quality (e.g., Laut et al. 2025; Munif et al. 2023; Ibrahim et al. 2025), representing a variety of active ingredients, methods, and ointment bases. Sudaryono defines this purposive sampling as a non-probability technique suitable for in-depth qualitative studies, while Sugiyono emphasizes the representativeness of secondary samples for generalizability of findings.

The procedure begins with a literature search using journal databases, followed by inclusion/exclusion selection, full reading, thematic data recording, and descriptive analysis to construct a comprehensive narrative. The final stage involves cross-validating the findings with primary references such as Arinata (2025), Davis (2021), and Lestari (2023) to ensure consistency of patterns such as the superiority of hydrocarbon bases. Creswell outlines the literature review procedure as an iterative cycle from exploration to interpretation, reinforced by Emzir with systematic steps for qualitative data collection and reduction.

RESULTS AND DISCUSSION

NO	ACTIVE INGREDIENTS	PRODUCTION METHOD	OINTMENT BASE	RESULTS
	Ethanol Extract White Flower Bush (Chromolaena Odorata) Formula 10% = 2 9 Formula 20% = 4 G	The ointment was prepared in two concentrations, namely 10% and 20%, each amounting to 20 g, with three times Repeat. The ingredients to be used are weighed according to the measurements. The ointment base is placed in a porcelain dish and then melted in a water bath until the base melts.	Vaseline album Formula 10% = 17.9 g Formula 20% = 15.9 g	The results showed that the semi-solid cream had a dark greenish color with a distinctive aroma of C. Odorata leaf extract. The ointment preparation was homogeneous and had a safe pH value of 6.2 and 6.3 for concentrations of 10% and 20%. The natural ointment showed good spreadability with a size of 5.57 cm and 5.23 cm for concentrations of 10% and 20%. (Laut M, M., et al., 2025)
	Teki Plant Extract (20%, 30%, 40%)	Melting process. The hydrocarbon base and water absorbent are heated in a porcelain dish using a water bath until melted. The melted base is then placed in a mortar and propylparaben is added while stirring until homogeneous. Then, the nutmeg extract is added to the mixture little by little while stirring. stirred until homogeneous.	Absorbent base: Itto alba (6.4%; 5.6%; 4.8%), Vaseline album (68.8%; 60.2%; 51.6%), Wool fat (2.4%; 2.1%; 1.8%), Cetyl alcohol (2.4%; 2.1%; 1.8%). Hydrocarbon base: Itto alba (4%; 3.5%; 3%), Vaseline album (76%; 66.5%; 57%).	The results of the study showed that the ethanol extract of the nutsedge plant formulated into an ointment preparation met several evaluation test criteria, namely the organoleptic test; the adhesive test; and the homogeneity test. (Munif, A,. et all, 2023)
	Mangkokan Leaf Ethanol Extract (10%)	through the melting method, which was chosen because of its ability to maintain skin moisture and increase drug retention (Primadiamanti et al., 2020; Sangkal et al., 2020). Three extract concentrations (10%, 20%, 30%) were tested to evaluate the physical stability and effectiveness of active substance release, with the addition of nipagin (0.1%) as an oil-soluble preservative (Rowe et al., 2009), menthol (0.5%) as a penetration enhancer, and cera alba to optimize consistency.	It's alba (5%) Vaseline album (34.95% / 24.95%)	The results of phytochemical testing showed the presence of secondary metabolite compounds, namely alkaloids, flavonoids, saponins and tannins, the results of the physical evaluation of the three ointment formulas met all test parameters: having stable organoleptic properties, homogeneous texture, pH 4.5-7.0 which is suitable for the skin, optimal spreadability of 5-7 cm, adhesive power of more than 4 seconds, these findings prove that mangkokan leaf extract can be formulated into an ointment preparation that meets the quality standards of topical preparations with the best performance at a

				concentration of 30%. The conclusion is that the Formula with an extract concentration of 30% provides the best performance, so that mangkokan leaf ointment has the potential to be an effective topical preparation and meets physical quality requirements. (Ibrahim M, A, et al, 2025)
	Ethanol Extract of Miana Leaves (Eedm) = 0%, 5%, 10%, 15%	Mixing method. Begin by weighing all ingredients according to the formula. Then, grind nipagin, nipasol, and BHT until smooth. Then, add adeps lanae while continuing to grind. Next, add some Vaseline album and grind again until an ointment base is formed.	Wool fat (10%) Propylene glycol (5%), Vaseline album (ad 100%)	Ethanol extract of miana leaves has activity in inhibiting the growth of Staphylococcus aureus at concentrations of 50, 100 and 150 mg/ml with results included in the strong category. Therefore, the ethanol extract of miana leaves can be formulated into an ointment preparation and meets the standards for organoleptic evaluation, homogeneity, pH, adhesive power and spreadability. The increasing concentration of the extract in the preparation affects the value of the spreadability and adhesive power of the preparation. The FIII ointment preparation with a concentration of 15% ethanol extract of miana leaves is effective in inhibiting the growth of Staphylococcus aureus bacteria. (Nurbayasanti, et al., 2024)
	Bay Leaf Extract = 15 G (30%), 22.5 G (45%), 30 G (60%)	The ointment is made by weighing the base and putting it into a mortar, then grinding it until it is homogeneous. After the base is mixed, add the bay leaf extract and grind it again until it is homogeneous. After it is homogeneous, put it into an ointment pot and you get a bay leaf extract ointment.	Adeps lanae: 5.25 g (30%), 4.125 g (45%), 3 g (60%). Vaseline album: 29.75 g (30%), 23.375 g (45%), 17 g (60%).	The results of the antibacterial activity study on the bay leaf extract ointment preparation with a concentration of 30% was 3.30 mm which was categorized as weak, a concentration of 45% was 4.10 mm which was categorized as weak and a concentration of 60% was 4.95 mm which was also categorized as weak. The results of the statistical test, namely Kruskall-Wallis, obtained a sig. <0.05 value which means there is a difference between the test groups. Further tests were

				carried out using the Dunn's test and the results showed that there was a significant difference between the negative control and the positive control and formulation 3, while the positive control was significantly different from formulation 3. The three formulations of bay leaf extract ointment preparations have physical qualities that meet the standards of ointment preparations and have the potential to inhibit the growth of Staphylococcus aureus bacteria. (Dwiningrum R, et all, 2025)
	Binahong Leaf Extract: 10% W/V (F1), 20% W/V (F2), 30% W/V (F3)	The manufacturing process begins by melting stearyl alcohol and white petrolatum in a water bath at a temperature of 65° to 70° C. then heating to temperature mix at about 75°C (Mix A). Add the other ingredients including the thick extract Anredera scandens (L.) leaves Moq. into distilled water and heat to 75°C (Mixture B). Add Mixture B to Mixture A. slowly while stirring.	Stearyl alcohol: 25% w/w (F1), 25% w/w (F2), 25% w/w (F3). White petrolatum: 25% w/w (F1), 25% w/w (F2), 25% w/w (F3).	The evaluation test results of the three binahong leaf extract ointments (Anredera scandens (L.) Moq.) showed similar organoleptic tests, differing only in color. The spreadability test showed a diameter after being pressed of 5.4 cm, 5.3 cm and 5.1 cm. The adhesion test showed results of 12 seconds, 14 seconds and 15 seconds. The skin irritation test showed no irritation reaction. The homogeneity test showed The resulting ointment was homogeneous, with pH values of 5.6, 5.6, and 5.7. These results indicate the ointment was good and met standards. (Ardinata I, et al., 2023)
	Bidara Leaf Extract: Fi (–), Fii (40%), Fiii (50%), Fiv (60%)	Put Vaseline and adeps lanae into the mortar and grind until homogeneous, then put cetyl alcohol into the porcelain cup. and heated on an electric stove until melted, after which methyl is added. paraben stir until homogeneous after homogenous add propylene glycol little by little until an ointment base is formed and put into a mortar grind until homogeneous.	Adeps lanae 2% Cetyl alcohol 5% Propylene glycol 15% Methyl paraben 0.1% Vaseline album ad 15 g	The results of the study showed that the results of the antibacterial ointment preparation of Bidara leaf extract with concentrations of 40%, 50% and 60% w/v met the results of the organoleptic evaluation test, homogeneity, spreadability test, adhesiveness test and pH test. The results of the ANOVA analysis showed that the formulation of the ointment preparation of Bidara leaf extract (Zizyphus mauritania) with concentrations of 50% and

				60% w/v had non-significant antibacterial activity with gentamicin sulfate ointment as a positive control against the growth of Staphylococcus aureus bacteria. (Pratiwi S, et all, 2023)
	Croton Leaf Extract: A (0.08 G), B (0.08 G)	All ingredients are melted over a water bath using a porcelain cup until melted and stirred occasionally until homogeneous and forms an ointment mass.	Vaseline album: A (46.40 g), B (–) Cera alba: A (3 g), B (–) PEG 400: A (–), B (26.64 g) PEG 4000: A (–), B (17.76 g) Stearyl alcohol: A (–), B (5 g)	The results of the study showed that croton leaf extract can be formulated into ointment preparations with a hydrocarbon base and a water-soluble base. The formulation of croton leaf extract with a hydrocarbon base and a water-soluble base affected physical stability such as organoleptic tests, pH, homogeneity, and spreadability, but was unstable in viscosity and adhesion tests. (Sawiji R, T,. et al., 2021)
	Papaya Leaf Extract: F(I) = 1 G, F(Ii) = 1.5 G, F(Iii) = 2 G	Dissolve the Vaseline album in a water bath until melted. Combine the glycerin and Vaseline album in a mortar. Add the nipagin, alcohol, and propylene glycol, and mix until smooth.	Glycerin: F(I) = 0.5 g, F(II) = 0.5 g, F(III) = 0.5 g Vaseline album: F(I) = ad 10 g, F(II) = ad 10 g, F(III) = ad 10 g	The results of the homogeneity test F1, F2, and F3 were homogeneous. The results of the pH test, adhesion test, and spreadability test of the three formulas met the requirements for ointment preparation values. The conclusion was that the best formula was the ointment preparation with the addition of 2 grams of papaya leaf extract. The results of the quality test carried out by the three formulas met the requirements for ointment preparation values. (Azizah S, N, et al., 2024)
	Garlic Extract: F1 = 2.5% B/V F2 = 5% B/V F3 = 7.5% B/V F4 = 10% B/V	solid paraffin and cera alba melted using a hot plate. After that, the solid paraffin and cera alba that have been melted are put into hot lumping then added with vaseline, mixed until homogeneous. Added DMDM hydantoin and phenoxyethanol are mixed until homogeneous at a constant speed. After cooling, oleum citri is added and mixed until homogeneous.	Cera alba: F1 = 6%, F2 = 6%, F3 = 6%, F4 = 6% Oleum citri: F1 = 0.54%, F2 = 0.54%, F3 = 0.54%, F4 = 0.54% DMDM hydantoin: F1 = 0.36%, F2 = 0.36%, F3 = 0.36%, F4 = 0.36% Phenoxyethanol:	The results showed that the garlic (Allium sativum L.) ethanol extract ointment could inhibit Staphylococcus aureus and Staphylococcus epidermidis bacteria where a concentration of 10% Staphylococcus aureus bacteria produced an inhibition zone of 15.5 mm, including the strong category, and Staphylococcus epidermidis bacteria produced an inhibition zone of 15.1 mm, including the strong

			F1 = 0.36%, F2 = 0.36%, F3 = 0.36%, F4 = 0.36% Solid paraffin: F1 = 10%, F2 = 10%, F3 = 10%, F4 = 10% Vaseline album: F1 = ad 100%, F2 = ad 100%, F3 = ad 100%, F4 = ad 100%	category, and formula F4 was the best formula in producing an inhibition zone. (S. MNR, et all, 2021)
	Chinese Ketepeng Leaf Extract (Cassia Alata L.)	Album Vaseline is mixed simultaneously with melted cera alba. Then stir until all the ingredients are mixed and then add the thick extract stirred until homogeneous and added with methyl paraben until homogeneous.	Vaseline Album Basis 90.9% 86.9% 82.9% Cera Alba Basis 4% 8% 12%	The ointment preparation of ethanol extract of Chinese ketepeng leaves F1, F2, and F3 is brownish green in color, has a distinctive smell of Chinese ketepeng leaves and is solid. (Kawarnidi.T, et al. 2022.)
	Ethanol Extract of Torch Ginger Flowers (Etlingera Elatior (Jack) RMSm.)	The ointment-making process involves melting PEG 400 and PEG 4000 in a water bath at 70°C until homogeneous. Then, the mixture is put into a mortar and pestle, and the ethanol extract of torch ginger flowers is added. Stir until an ointment mass is formed, then pour it into a pot. ointment	Ointment base PEG 400 60 57 54 51 PEG 4000 40 38 36 34	Concentrations of 10% and 20% are homogeneous; pH 6.2-6.3 (safe for skin); spreadability 5.57-5.23 cm; blackish green color with a distinctive aroma. (Setyaningsih et al, 2022)
	Clove Leaf Ethanol Extract (Syzygium Aromaticum Folium)	Hydrocarbon Ointment for FI, FII, and FIII Phase I Cera alba according to the calculation of ingredients and vaseline album according to the calculation of ingredients melted over a water bath at 75-80 oC using a mortar and pestle, stirred until homogeneous. Phase II nipagin and menthol are mixed and dissolved together after which the main ingredient, namely clove leaf extract (Syzygium aromaticum folium), is added and stirred until homogeneous. After phase II is homogeneous, phase I is added and mixed until both phases are homogeneous.	Cera alba 10 15 20 base/Thickener Cera alba 10 15 20 base/thickener	Ointment preparation F1 (76%: 10%) meets the requirements for a good and stable ointment, while F2 (71%: 15%), and F3 (66%: 20%) do not meet the requirements for a good and stable ointment (Djarami et al. 2020).
	Turmeric Rhizome Extract (Curcuma Domestica)	The base of vaseline album and adeps lanae are weighed according to the formula and then mixed with each other using the mixing method and ground in a mortar until homogeneous. Turmeric extract which has been weighed and then added to each ointment base and then ground in a mortar until homogeneous.	Vaseline Album (g) 25.5 20.4 21.67 22.95 Adeps Lanae (g) 4.5 3.8 3.8 3.8	Turmeric rhizome ethanol extract ointment met the physical properties test requirements, including organoleptic, pH, adhesion, and spreadability. (Larasati et al. 2022)
	Lime peel extract	Mix the melted petroleum jelly and glycerin in a mortar and pestle until smooth. Add the adeps lanae and grind until smooth, then add the nipagin,	Glycerin A, B, C = 1 gram Adeps lanae A = 2 grams	The results of the study showed that orange peel extract ointment with a concentration of 20% provided healing on the 7th

		alcohol, and propylene glycol and grind until smooth.	B = 2 grams C = 1 gram Propylene Glycol A = 0.02 grams B = 0.02 grams C = 2 grams Nipagin Alcohol A, B, C = qs (as needed) Vaseline Album A, B, C = ad 20 g	day, ointment with a concentration of 10% and 15% on the 8th day. It can be concluded that lime peel extract ointment can be used as a wound healing agent for type I diabetes mellitus. (Ulfa et al., 2021)
	Water phase of snakehead fish extract 30%, Kelulut honey 30%	The ointment preparation, a combination of the aqueous phase of snakehead fish extract and kelulut honey, was prepared by mixing two different mixtures. The aqueous phase, consisting of snakehead fish extract and kelulut honey, was heated and mixed with carbopol, TEA, and vitamin C until homogeneous. Meanwhile, adeps lanae was ground with BHT, methylparaben, and propylparaben dissolved in propylene glycol. The two mixtures were then combined and stirred until homogeneous, thus forming a ready-to-use ointment preparation with a stable and homogeneous texture.	Adeps lanae Ad 100 (Control, F1, F2, F3, F4)	The results showed that formula 3 (BHT 0.1% and Vitamin C 0.1%) was the best formula because it met the physical stability test requirements for ointment preparations, namely producing a homogeneous preparation, with a thick texture, good protective power, an acid number of 10.02 mg. The average adhesive power was 54 seconds and the spread power was 5.07 cm. SPSS analysis showed that all formulas had significant differences between the spread power and adhesive power with respect to storage time ($P<0.05$). (Mardiansyah et al., 2024)
	Zinc Oxide	Zinc oxide is sieved to prevent clumping. Mix zinc oxide and ascorbic acid in a homogeneous mortar. Melt the cera alba and Vaseline album on a water bath. Add oleum mentha piperitae so that it becomes a zinc oxide ointment preparation.	Cera Alba 10% Vaseline Album Ad 100%	There is an effect of variations in cera alba concentration on the evaluation of spreadability, where formula I (5.75 cm) has better spreadability than formula II (4 cm) and formula III (2 cm). The requirement for ointment spreadability is 5-7 cm. The most optimal formula from this study is formula I. (Qomariyah, Z and Ratnasari, D, 2022).
	Mangrove leaf extract (Rhizophora mucronata) (Lamk)	Melt the solid paraffin and cera alba on a hot plate. Then, mix the solid paraffin and cera alba and pour them into a hot mortar. and add vaseline album until evenly. Add Phenoxyethanol until evenly mixed using speed consistent, after the cold solution is followed by with the addition of olive oil	Cera Alba 6% Oil 0.5% Olives 4% Phenoxyethane 4% ol 6% Solid Paraffin 10%	The results of the study showed that mangrove leaf ointment (Rhizophora mucronata Lamk) met the physical quality test requirements, including organoleptic tests, homogeneity, pH, spreadability, adhesion, stability, hedonic and

		mixed until homogeneously mixed. After it cools, extract the mangrove leaves from various concentrations (2.5%, 5%, 7.5% and 10%) is added to the mixture.	Vaseline Album ad 100%	irritation. Antibacterial tests showed that ointment with mangrove leaf extract (Rhizophora mucronata Lamk) at concentrations of 2.5%, 5%, 7.5% and 10% could inhibit the growth of Staphylococcus aureus with an average diameter of 6.4 mm, 8.4 mm, 7.3 mm and 8 mm. (Kurnia et al., 2020)
	Mulberry Leaf Extract (Morus Alba L.)	Heat the Cera flava and Vaseline album mixture in a water bath until completely dissolved. Once the mixture is dissolved, turn off the heat and wait until the temperature of the mixture drops to around 50°C. Add the mulberry leaf extract and propyl paraben to the Cera flava and Vaseline album mixture. which has cooled. After all the ingredients are added, stir the mixture until the ingredients are mixed evenly and the temperature is stable at room temperature, after which the ointment is ready to be evaluated. physique.	Vaseline album = 5g, 9g, 8.5g, 8g Cera flava = 5g, 1g, 1.5g, 2g	The base combination with the best physical evaluation results and the potential to be used as a base for mulberry leaf extract ointment is Formula 1, with a ratio of 1:9. (Suryani et al. 2024)
	Hibiscus Leaf Ethanol Extract (Hibiscus Rosa-Sinensis L.)	Hibiscus leaf ointment formulations are made with various bases, namely hydrocarbon, absorption, water-absorbing ointment, and water-washable. The hydrocarbon base consists of solid paraffin, yellow vaseline, and white beeswax. The absorption base uses adeps lanae, stearyl alcohol, and yellow vaseline. Meanwhile, the water-absorbing ointment base consists of stearyl alcohol, yellow vaseline, and distilled water, which are heated separately before being mixed. The water-washable base uses a combination of PEG 4000 and PEG 400, which are melted and mixed. In all formulations, hibiscus leaf extract is added and ground until homogeneous.	Methyl paraben 0.025% Propyl paraben 0.015% Sodium laurel sulfate 1% propylene glycol 12% stearyl alcohol 25% Yellow Vaseline 24% Aquades 37% ad 100%	The most appropriate Hibiscus rosa-sinensis L. leaf extract ointment preparations are hydrocarbon-based and absorption-based. (Davis et al. 2021)
	Ethanol Extract of Makasar Fruit	Makasar fruit was extracted using a maceration method using 96% ethanol. After being dried and blended, the powdered herbal extract was soaked for 72 hours, stirring and changing the solvent every 24 hours. The resulting extract was then filtered and evaporated using a rotary evaporator. Next, an ointment was prepared in two concentrations, 15% and 20%, using the ethanol extract of makasar fruit as the base ingredient. A 14-gram ointment was prepared, with three replications for each concentration.	Alpha Tocopherol 0.05 g Propyl Paraben 0.05g White Vaseline 11.8g	The results of the research, testing and discussion, it can be concluded that the ethanol extract of Makasar fruit (Bruceae javanica [L.] Merr) can be made as an ointment preparation. Organoleptic, homogeneity and pH tests show that both ointment concentrations (15% and 20%) meet the requirements for making ointment. (Jacob et al., 2022)

	Leaf Extract Avocado	The tools and materials were prepared, then the ingredients such as PEG 400, PEG 4000, propylene glycol, and distilled water were weighed and heated until melted. These ingredients were then mixed in a mortar, oleum rosae added, and stirred until an ointment mass was formed. After that, avocado leaf extract was added little by little and stirred until homogeneous. The finished ointment was stored in a pot and continued with evaluation testing. The same process was carried out for ointment formulas II and III.	PEG 400 40% PEG 4000 30% Propylene Glycol 5%	The statistical analysis showed a significant difference in the inhibition zone (P = 0.05) in the avocado leaf extract anti-acne ointment. Based on the results of the study, it was concluded that the avocado leaf extract anti-acne ointment with the best physical properties and greatest inhibitory activity was found in formula I with a concentration of PEG 400 and PEG 400, namely 1.3%:1%. (Widianti, R, A., et all 2023)
	Ethanol Extract of Curry Leaves (Murraya Koenigii L.)	The extract was made by maceration using 70% ethanol. A total of 700 g of powdered simplicia was placed in a maceration container, then 1275 ml of 70% ethanol was added. The maceration container was tightly closed and left for 5 days, protected from light. while stirring continuously. The dregs were washed with 750 ml of filter fluid until all the extract was obtained, then left for 2 days and filtered. The macerate was evaporated with the help of a rotary evaporator at a temperature of 60°C and concentrated in a freeze dryer until the extract was thick.	Hydrocarbons	Concentrations of 5%, 10%, and 15%: organoleptically stable; homogeneous; pH 4.7-7.5; spreadability >5 cm; adhesiveness >4 seconds; non-irritating; best at 15% for wound healing. (Andilala et al., 2025)
	Basil Leaf Juice (Ocimum Basilicum L.)	The preparation of basil leaf juice ointment was formulated with 20 g of each concentration, namely 2.5%, 7.5%, and 10%. After each ingredient was mixed, weighed according to the calculations above, each ingredient is put into The porcelain cup is melted on a hot plate at 60°C and stirred at a constant speed. It is then removed and stirred until an ointment mass is formed.	Vaseline album = 7.5 g, 2.975 g, 2.925 g, 2.9 g Adeps lanae =42.5g, 16.975g, 16.925g, 16.9g	Concentrations of 2.5%, 7.5%, and 10%: contain flavonoids, tannins, and steroids; organoleptic: semi-solid, white/green in color, basil-like odor; pH 5-6; homogeneous; spreadability 3.4-5 cm; adhesiveness 3.5-4.2 seconds; meets the requirements. (Hasanah et al., 2022)
	Salicylic Acid	The tools and materials were prepared, then divided into two phases: the oil phase consisting of cetyl alcohol, stearyl alcohol, vaseline album, and nipasol, which were melted in a water bath until homogeneous. The water phase consisting of sodium lauryl sulfate, liquid paraffin, propylene glycol, nipagin, and distilled water was then mixed into a hot mortar. The two phases were mixed and stirred until homogeneous. Salicylic acid was then added and stirred until a homogeneous ointment mass was formed. After that, the finished ointment was put into an	Vaseline Album 25%	Homogeneous; STA > SLA spreadability; same pH (around 4); ZOI antibacterial activity STA < SLA (15.90 mm vs 21.73 mm). (Novita et al., 2022)

		ointment pot for storage and further use.		
	Betel Leaf and Binahong Leaf Extract	The ingredients were weighed, then PEG 4000 was melted in a water bath and mixed with PEG 400 in a hot mortar until homogeneous. Methylparaben and alpha-tocopherol were added and ground to form a thick ointment mass. Betel leaf and binahong extracts were added little by little and ground until homogeneous. The finished ointment was then poured into a pot.	PEG 400 (g) 40 PEG 4000 (g) 10 Methyl paraben (g) 0.01 Alpha Tocopherol (g) 0.0005	The results of the organoleptic test showed that there were no changes in the ointment preparation after the storage period. The results of the homogeneity test showed that the ointment preparation produced had homogeneous properties. The results of the ointment pH evaluation were in the range of 4.5-4.8. The results of the ointment spreadability evaluation were 5.1-5.5 cm. The results of the irritation evaluation showed that there was no irritation to the skin after the ointment was applied. The results of the antibacterial activity test of the ointment preparation showed that the inhibition zone of the ointment with the combination of betel leaf extract and binahong leaf (2:1) was 28.56 mm and was significantly different from all treatments in inhibiting Staphylococcus aureus. (Aini, Q and Rasidah, 2023)
	Jamblang Leaf Extract (S. Cumini)	0.22 g of Nipagin was dissolved in 73.85 g of PEG 400, then 25.93 g of PEG 4000 g is melted into the mixture and stirred until cool. Jamblang leaf extract (S. cumini) is added according to the treatment (0%; 5%; 10%; 15%) and stirred until homogeneous	PEG 400 73.85g PEG 4000 25.93g	The results obtained showed that jamblang leaf extract contains flavonoids, triterpenoids, tannins, saponins, and alkaloids. The best results in the extract and ointment inhibition zone test were seen at a concentration of 10% which had the best antibacterial activity against P. acnes with an inhibition zone diameter of 9.17 mm, while the best stability test results were in the ointment concentration of 15% with a pH of 6.5 ± 0.5, a spreadability of 3.17 ± 0.26, and an adhesiveness of >2 minutes. (Setiawan et al., 2024)
	Aloe vera flesh extract	The weight of the ointment base, consisting of Adeps lanae, vaseline album, cera alba, and steryl alcohol, is carefully measured. The ointment base is melted over a water bath until liquid, then transferred into a heated mortar to form the ointment base. Next, the	Adeps lanae 3g Vaseline album 85.9 g Cera alba 8g Sterile alcohol 3g	Tests on purulent wounds in test animals such as mice obtained moderate healing scores in F1, F2, F3 and K+ (gentamicin sulfate 0.1%) is strong, so it can be said that

		ingredients are ground while adding aloe vera leaf flesh gradually. The grinding process is carried out until all ingredients are mixed homogeneously, and then Propyl paraben is added and ground again until homogeneous.	Propyl paraben 0.1g	the preparation of aloe vera leaf flesh ointment can inhibit the growth of antibacterials in healing purulent wounds even though the category being compared with Gentamicin ointment 0.1% with a strong (sensitive) category. (Dena, M., et all 2023).
	Meistera Stem Extract Chinese	Prepare tools and materials. Weigh the ingredients according to calculations. Melted down alba over a water bath until melted. Gradually add the cera alba. has melted into a mortar containing Vaseline album, ground until homogeneous to form an ointment base. Disodium EDTA, methyl paraben, propyl paraben, and alpha tocopherol are added to the mortar and ground until homogeneous. Meistera chinensis stem extract is added to the ointment base and then ground. until homogeneous.	Methyl paraben Propyl paraben Cera alba Vaseline album,	The adhesive power of the preparation meets the requirements of the adhesive power test, which is not less than 4 seconds and the irritation test on the ointment preparation shows that it does not cause irritation to the skin. From the results of the research Keywords: Ointment, Meistera Chinensis Stem, it shows that Meistera chinensis stem extract can be formulated into ointment preparations at concentrations of 30%, 35% and 40% and all formulas Manuscript received: July 02, 2022 Manuscript accepted for publication: 05 meet the requirements for physical evaluation of the preparation. (Badia, E., et all 2022)
	Ethanol extract of tekelan leaves 5% (w/v): (F1 = 1.25 g | F2 = 1.25 g | F3 = 1.25 g | F4 = 1.25 g)	The ointment was made using several different formulas. Formula 2 was made by melting vaseline album, cera alba, adeps lanae, and stearyl alcohol, then mixing it with tekelan leaf extract until homogeneous. Formula 3 was made by melting stearyl alcohol and vaseline album, then mixing it with a mixture of sodium lauryl sulfate, propylene glycol, and distilled water that had been added with methyl paraben, then adding tekelan leaf extract. Formula 4 was made by melting PEG 4000 and mixing it with cetyl alcohol, PEG 400, and tekelan leaf extract until homogeneous. Each ointment formula was then poured into a provided pot.	Vaseline album: (F1 = 22.57 g | F2 = 20.43 g) Cera alba: (F1 = 1.18 g | F2 = 1.9 g) Adeps lanae: (F2 = 0.71 g) Stearyl alcohol: (F2 = 0.71 g | F3 = 5.94 g) Sodium lauryl sulfate: (F3 = 0.24 g) Propylene glycol: (F3 = 2.785 g) Methylparaben: (F3 = 0.005 g) Propyl paraben: (F3 = 0.003 g) Aquades: (F3 = 8.78 g) PEG 4000:	The test results show that the difference in base has an effect on organoleptic parameters, power spreadability, adhesion, and acceptability of the ointment. Ointments F3 (washable base) and F4 (water-soluble base) meet all the physical characteristics requirements of a good ointment, while ointment F1 (water-soluble base) hydrocarbons) and F2 (water-absorbing base) do not meet the adhesion requirements. (Susanti et al., 2022)

			(F4 = 11.28 g) PEG 400: (F4 = 11.28 g) Cetyl alcohol: (F1 & F4 = 1.19 g) Aloe vera: (F1–F4 = qs)	
	Avocado leaf extract: 17.5%	A 250 g sample was macerated using 96% ethanol, placed in a jar, and macerated for 72 hours (3 x 24 hours) in a cool, light-protected place. Stirring and solvent replacement were performed every 24 hours. On the 3rd day of filtration, all the filtrates obtained were then collected and then the filtrate evaporated using a vacuum rotary evaporator at a temperature of 30°C until the ethanol has evaporated and a thick extract remains.	PEG 400: 24.75% PEG 4000: 57.75% Oleum rosae: qs	The results showed that FI, FII, and FIII were able to meet the physical properties of good ointments, but the physical properties of spreadability did not meet the criteria. The bacterial growth inhibition for FI, FII, and FIII were 15.96 ± 0.351 mm, 14.4 ± 0.721 mm, and 13.06 ± 0.503 mm, respectively. The conclusion of this study is that all formulas can be used as ointments and can inhibit the growth of Propionibacterium acnes bacteria. It is hoped that future researchers can develop formulations in other dosage forms and use other acne-causing bacteria to determine the ability of avocado fruit ethanol extract to inhibit bacterial growth (Angelia et al., 2022).
	Cassava leaf extract: 2 g	Oil ingredients (cetyl alcohol, lanolin, nipasol, Vaseline album) is melted in a water bath. The water ingredients (cassava leaf extract, nipagin) are mixed together. The oil and water ingredients are mixed until homogenized in a hot mortar. After being prepared, it is transferred to a suitable container and then subjected to a physical evaluation.	Cetyl alcohol: 4 g Lanolin: 10 g Nipasol: 0.05 g Nipagin: 0.15 g Vaseline album: 79.8 g	The results of the study showed that the cassava leaf extract ointment met the requirements for the physical evaluation test of ointment preparations. The statistical test results showed a significant effect on wound healing in male rabbits ($p<0.05$). The average percentage of burn wound healing in rabbits from day one to day ten showed that the ointment formula that was effective in healing burns was formula II with a cassava leaf extract concentration of 4%, followed by formula IV with a concentration of 8% and a positive control on day six (Ohee et al., 2024).
	Ethanolic Extract of Purple Sweet	Cera alba and solid paraffin are melted at 70° C in a water bath. After they have completely melted, they are put	Solid paraffin 5g	Phytochemicals. The results obtained showed that purple sweet potato leaves contain

	Potato Leaves (Ipomoea Batatas Sp.)	into a hot lump. Then, liquid paraffin is added. and grind slowly until cold and homogeneous, then extract the ethanolic cassava leaves Add the purple sweet potato little by little and then grind it until smooth.	Liquid paraffin ad50	flavonoids, saponins, alkaloids, terpenoids, and tannins. Next, an ointment formulation was made. The ointment preparation The physical preparation has been evaluated (organoleptic, homogeneity, pH, spreadability, adhesion and irritation test on the skin of volunteers). The results of the evaluation of the physical properties and irritation test of the ethanolic extract of purple sweet potato leaves with concentrations of 0%, 2%, 4% and 6% are the concentrations that will be used to make ointment preparations. The results obtained indicate that the formulation has met the physical requirements and irritation test at a concentration of 2% in the parameters organoleptic, homogeneity, pH, spreadability, and adhesiveness. (Hadi, I., et al., 2023).
	Porang Tuber Extract (Amorphophallus Meulleri Blume)	In this study, two formulas were created with different ointment bases. The first formula was a hydrocarbon ointment base using Vaseline album, while the second formula was a water-removable ointment base using PEG 4000 and PEG 400. Both formulas were made with concentrations of porang tubers of 5%, 10%, and 15%, respectively, with a negative control of 0%.	Lanolin 10.0% Nipagin 0.15% Vaseline album 85.8% PEG 4000 (40%) PEG 400 (60%)	The results of the research that has been carried out can be concluded that: All hydrocarbon-based ointment preparations and easy to wash with concentrations of 0%, 5%, 10% and 15% meet the quality parameters of organoleptic tests, homogeneity, adhesive power and pH tests. Hydrocarbon-based ointment preparations with concentrations of 0%, 5%, 10% and 15% meet the parameters of spreadability. Easy-to-wash ointment base preparations at concentrations of 0%, 5%, 10% and 15% meet the parameters of spreadability, while easy-to-wash ointment bases at concentrations of 0%, 5%, 10% and 15% meet the parameters of spreadability. A better ointment base is used based on the results of the physical stability test of stable

				preparations at concentrations of 0%, 5%, 10% and 15% (Sapitri et al., 2024).S
	Chrysanthemum Leaf Extract (Chrysanthemum morifolium)	The resulting thick chrysanthemum leaf extract was formulated into different formulations with different concentrations of 12.5%, 25%, and 50%. The ointment base used was Vaseline album. Each required ingredient was weighed according to the formulation. The weighed Vaseline album was then placed in a porcelain cup and melted over a water bath. The melted base was stirred until homogeneous in a mortar. Next, the extract was added little by little and stirred until homogeneous.	Adeps lanae = 3g, 2.62g, 2.25g, 1.5g Vaseline album = 17g, 14.88g, 12.75g, 8.5 g	The results of the Antibacterial Activity Test of Chrysanthemum Leaf Ointment Formulation (Chrysanthemum morifolium) against Staphylococcus aureus bacteria can be concluded that chrysanthemum leaf extract ointment with concentrations of 12.5%, 25%, and 50%, has antibacterial activity against Staphylococcus aureus bacteria, this is seen from the diameter of the inhibition zone produced by each concentration. The 50% concentration has the largest inhibition diameter, namely 22.2 mm, while for the 12.5% concentration it is 7.25 mm, and the 25% concentration is 9.85 mm (Rawung et al., 2020)
	Karamunting leaf extract (Rhodomyrtus tomentosa)	Karamunting leaves were extracted using ethanol using a maceration method, with a ratio of 1:3 of the drug to ethanol, for three extraction stages, each lasting two days. The liquid extract was evaporated until a thick extract was obtained. An ointment was made by mixing the ethanol extract of Karamunting leaves with Vaseline in a ratio of 1:10. The finished ointment was stored in a sterile bottle that had been heated in hot water at 60°C for 15 minutes. If stored properly, the ointment can be used. up to 3 months.	Vaseline 1:10.	Another study showed that karamunting leaf extract can be used to make a phytopharmaceutical preparation, namely a 10% ethanol extract in a vaseline base that can cure skin infections in rabbits within 5 days of treatment. (Ferlinahayati, et al., 2024)
	Tiger grass extract	Adeps lanae 15 grams and Vaseline album 85 grams. The ointment is made by sterilizing all equipment using 70% alcohol. Then, mix the Vaseline album and Adeps lanea in a mortar and pestle, stirring continuously, until smooth. The tiger grass extract ointment is made in the same way: the finished ointment base is melted again and the extract is added little by little until it is homogeneous and forms an ointment.	Vaseline Album = 9.2 gr, 8.8 gr, 8.4 gr Adeps lanae = 9.2 gr, 8.8 gr, 8.4 gr	Vaseline Album, Adeps lanae Results: The results obtained in group I (ointment base) and group II (betadine ointment) showed that the average wound closure rate was not significantly different, so there was no significant difference. However, pharmacologically, tiger grass extract ointment was effective in wound healing. The three concentrations of 8%, 12%, and 16% provided

				a wound healing effect, with the optimal effect in accelerating wound healing being the 16% concentration with an average wound closure time of 9.3 days. Therefore, it can be concluded that tiger grass is effective in wound healing (Tamuntuan et al., 2021).
	Flower extract telang	Antioxidant extract ointment is made by mixing vaseline album, liquid paraffin and nipasol, weighed and melted on a water bath. The melted formula is put into a mortar and stirred until an ointment base is formed, then add the extract little by little while stirring until homogeneous. Vitamin C ointment is made by mixing vaseline album, liquid paraffin and nipasol, weighed, then melted on a water bath. The melted formula is put into a mortar and stirred until an ointment base is formed. Vitamin C is dissolved in 96% ethanol, then vitamin C is added little by little while stirring until homogeneous.	Vaseline Album 25g	Based on the results of statistical tests using on wound healing in rabbits, it showed a significant difference. The concentration of 0.2% was significantly different from the concentration of 0.4% where the time required for the concentration of 0.2% was faster than the concentration of 0.4%. (Hotimah, K., et all 2023)
	Ethanol Extract of Sintrong Leaves (Crassocephalum Crepidioides (Benth.)S.Moore)	Formulations 1, 2, and 3 were prepared by grinding the ingredients in cetyl alcohol, then mixing them with PEG 4000 and heated glycerol. Sodium lauryl sulfate was dissolved in hot water and added to the first mixture, stirring until homogeneous and cooled. Methylparaben was added and ground, then the thick extract was mixed until homogeneous. This process resulted in 50 grams of ointment base with concentrations of 0.5%, 1%, and 1.5%, as well as a negative control without a sample.	PEG 4000 5g Methyl Paraben 0.07g	The results obtained from the characteristic examination indicate that the sintrong leaf simplicia has met the characteristic test requirements for simplicia. The phytochemical test results indicate that the sintrong leaves contain alkaloids, flavonoids, glycosides, saponins, tannins, and triterpenes or steroids. The results of the evaluation of the sintrong leaf ethanol extract ointment showed stable results. Formulation The best is formula 3 with a concentration of 1.5% with a wound healing diameter of 0.13 cm on the 21st day. (Saputri, M., et all 2023)
	Ethanol Extract of Semprawang Leaves (Dilenia Ochreata)	The process of making semprawang leaf ointment begins with collecting, cleaning, and drying the leaves. The dried leaves are then blended into a fine powder and extracted with 96% ethanol to obtain a thick extract. The ointment base is made from a mixture of adeps lanae and vaseline album, heated and stirred until homogeneous. The semprawang leaf extract is then mixed into the ointment base at a	Adeps lanae 15g Vaseline album 85g	Based on the questionnaire results (Table 1), the average community response to the implementation of this activity was 90%. The community felt this activity was very beneficial and 80% of respondents stated that this activity increased community knowledge and insight. The community

		concentration of 10% w/w, and the ointment is ready to be packaged in tubes or pots after being thoroughly stirred.		hopes this activity can be carried out routinely, even all respondents (100%) strongly agreed with activities like this. Furthermore, the community's response regarding the ointment product made, where 70-85% of respondents stated that the product quality was good, the product aroma was liked and it was practical to make. However, the response to the question of ingredients being easy to obtain and the need for ongoing assistance, the community gave a score of 85% and 40% disagreed, respectively. (Yohandini, H., et al. 2023)

DISCUSSION

Based on the results of a review of various studies summarized in this review article, it can be seen that ointment formulations from natural ingredients generally utilize medicinal plant extracts that have biological activity, especially as antibacterial, anti-inflammatory, and wound healing agents. The active ingredients used come from various parts of plants such as leaves (e.g., Chromolaena odorata leaves, mangkokan leaves, miana leaves, bidara leaves, papaya leaves, bay leaves, binahong leaves, mangrove leaves, avocado leaves, basil leaves, and chrysanthemum leaves), turmeric rhizomes, torch ginger flowers, and animal extracts such as snakehead fish and stingless bee honey. Most of the extracts are obtained through the maceration method using ethanol, a semipolar solvent that effectively extracts secondary metabolites such as flavonoids, tannins, saponins, alkaloids, terpenoids, and steroids, which are known to have important pharmacological activities in the wound healing process and inhibit the growth of pathogenic bacteria.

The most common ointment-making methods used in various studies are the melting method and the mixing (trituration) method. The melting method involves heating a base such as vaseline album, cera alba, stearyl alcohol, or paraffin until it melts, then mixing it with other ingredients and extracts until homogeneous. This method is widely chosen because it can produce preparations with a more uniform texture and facilitates mixing of ingredients with different melting points. Meanwhile, the mixing method without heating is used for materials that are relatively easy to mix or are sensitive to heat. Based on the results of physical evaluations, both methods are equally capable of producing ointment preparations that meet quality requirements, provided the grinding or stirring process is carried out until complete homogeneity is achieved.

The choice of ointment base also significantly impacts the physical characteristics and therapeutic performance of the preparation. Hydrocarbon bases, such as vaseline and paraffin, are widely used because they are chemically stable, do not oxidize easily, and provide an occlusive effect that can maintain skin moisture, thus accelerating the penetration of active ingredients. Absorbent bases containing adeps lanae or wool fat are able to absorb water and are suitable for delivering hydrophilic active ingredients. Meanwhile, water-soluble PEG-based bases are widely used because they are comfortable on the skin, non-sticky, easy to clean, and provide good physical stability. Several studies have shown that PEG bases and washable bases often provide optimal spreadability, while hydrocarbon bases tend to have higher adhesion, allowing the active ingredient to stay in contact with the skin for longer.

The physical quality evaluation of the ointment included organoleptic tests, homogeneity, pH, spreadability, adhesion, viscosity, stability, and irritation tests. The results showed that almost all formulations using optimal active ingredient concentrations met the criteria for good topical preparations. The pH value of the ointment generally ranged from 4.5 to 7.0, consistent with the physiological pH of the skin, making it safe and non-irritating. The spreadability of the majority of samples was in the range of 5–7 cm, indicating the ointment's ability to spread evenly upon application. Meanwhile, the adhesion of most formulations showed a contact time of more than 4 seconds, even reaching tens of seconds in some formulations, indicating good retention of the preparation on the skin surface.

In addition to physical quality, the biological effectiveness of ointments is also a key assessment parameter. Many formulations demonstrate antibacterial activity against pathogenic bacteria such as Staphylococcus aureus, Staphylococcus epidermidis, and Propionibacterium acnes. The resulting inhibition zone diameters vary, but some extracts demonstrate strong activity, particularly at high concentrations, such as garlic extract, chrysanthemum leaf extract, a combination of betel leaf and binahong, and mangrove leaf extract. On the other hand, some extracts exhibit weak to moderate activity, such as bay leaf extract, but still meet the requirements as topical preparations supporting the therapy of wounds or mild infections. This indicates that the effectiveness of ointments is greatly influenced by the type of active ingredient, the concentration of the extract, and the suitability of the base used to facilitate the release of the active substance.

Several studies have also examined the ability of herbal ointments to accelerate wound healing, including cuts, purulent wounds, burns, and diabetic ulcers. Extracts of lime peel, curry leaves, tiger grass, aloe vera, snakehead fish, and butterfly pea flowers have been reported to accelerate tissue regeneration, resulting in statistically significant healing results. This activity is thought to stem from the flavonoid, phenol, and antioxidant compounds present in these ointments, which suppress inflammation, inhibit microorganisms, and stimulate collagen formation and tissue epithelialization.

Overall, this study demonstrates that natural ointment formulations have significant potential as alternatives or adjuncts to synthetic topical therapies. The majority of the reviewed studies demonstrate that herbal ointments can be formulated with physical properties that meet pharmaceutical standards and demonstrate promising biological activity. Support from selecting the right manufacturing method, determining a suitable base, and optimizing the concentration of active ingredients are key factors in formulating successful formulations. Therefore, the development of natural ointment preparations has the potential to continue as safe, effective, and readily accepted phytopharmaceutical products.

CONCLUSION

This literature review found that the PSA Rapid Test is effective for early detection of prostate cancer in Indonesian and Indian men, with adjusted cutoff values such as 6.95 ng/mL (97.8% sensitivity, 42.2% specificity) in the Indonesian population, 5.4 ng/mL to reduce unnecessary biopsies in India, and a %fPSA ratio of 15% at low tPSA levels, which differentiates cancer from benign conditions such as BPH (Shahab et al., 2013; Agnihotri et al., 2014; Chang et al., 2015). These findings underscore the need for an individualized screening approach to address racial variations, low prevalence, and factors such as urinary retention or LUTS, which improves diagnostic accuracy compared to the standard international cutoff of 4 ng/mL (US Preventive Services Task Force, 2018; Mottet et al., 2021). Practical implications include clinical recommendations for PSAD and %fPSA in rapid triage in Southeast Asia, optimizing urology referrals and reducing overdiagnosis.

However, major limitations include the retrospective design of the three selected studies with small sample sizes, ROB-2 bias in outcome measures, and the lack of prospective data on specific PSA rapid tests and local validation (Ilic et al., 2018; Creswell & Poth, 2021). Suggestions for future research include multicenter RCTs with large sample sizes, standardization of metrics such as BIA/CT for LBM, and ethnic subgroup analysis for meta-analyses to confirm survival benefits and minimize uncertainty in LUTS patients (Sugiyono, 2023). This approach would strengthen Level 1a evidence for regional screening guidelines.

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