Available online at https://ejournal.corespub.com/index.php/ijhms/index

International Journal of Health, Medicine, and Sports

e-ISSN: 3026-7455

Vol. 2, No. 2, pp. 56-60, 2024

Stability, Characterization, and Antibacterial Activity of Cinnamon (Cinnamomum burmanii) Extract Mask Preparations as Potential Skin Care Products

Nestia Lianingsih[1*], Siti Hadiaty Yuningsih[2], Willen Vimelia[3]

[1,3]*Master's Program of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, Jatinangor, West Java, Indonesia*

[2]*Department of Mathematics, Faculty of Mathematics and Natural Sciences, National University of the Republic of Indonesia, Bandung, Indonesia*

**Corresponding author email: nestia23001@mail.unpad.ac.id*

Abstract

This study aims to evaluate the stability, physical-chemical characteristics, and antibacterial activity of a cinnamon extract (Cinnamomum burmanii) mask preparation. Cinnamon extract is obtained through the maceration method using 96% ethanol. The physical-chemical characteristics of the preparations were evaluated including water content, ash content, as well as phytochemical tests to identify active compounds such as alkaloids, flavonoids, tannins and saponins. Stability tests were carried out for 8 weeks at room temperature (25°C-30°C) and accelerated temperature (40°C), with pH and organoleptic testing parameters. Apart from that, a preference test for aroma, texture, and color is also carried out using a specified rating scale. The antibacterial activity of the preparation was evaluated using the disc diffusion method against Staphylococcus aureus. The research results showed that the cinnamon extract mask preparation had good stability, physical-chemical characteristics according to standards, and promising antibacterial activity, especially at an extract concentration of 12%.

Keywords:
Mask preparation, cinnamon extract, stability, characterization, antibacterial activity.

1. Introduction

Acne is a common skin condition, which is caused by problems with excessive oil gland production. This disorder causes blockage of hair follicles and skin pores, ultimately producing the lesions we know as acne. Acne can appear on various parts of the body such as the face, chest, back, and arms, and often causes discomfort and even pain for the individual who experiences it. Acne is not only a cosmetic problem, but can also affect the psychological well-being of the individual who experiences it (Priani, et al., 2020). This condition can cause stress and anxiety and affect a person's self-esteem. Therefore, the need for effective and safe solutions to treat acne is very important (Muhammad & Dewettinck, 2017).

Currently, the cosmetic market has provided various anti-acne products which are available in various forms such as creams, lotions and facial masks. However, most of these products contain synthetic chemicals that can cause irritation and allergic reactions in some individuals. Apart from that, long-term use of these chemicals can also harm skin health (Kean, et al., 2022).

Considering concerns about the side effects of anti-acne products that contain chemicals, the development of anti-acne preparations from natural ingredients is an attractive option. Cinnamon is a natural ingredient that has long been used in traditional medicine for various skin conditions, including acne. One plant that has the potential to treat acne conditions is cinnamon (Cinnamomum spp.). Even though it is widely known as a kitchen spice, its use in treating acne is still less widely known in Indonesian society (Liu, et al., 2023).

Previous research has shown that cinnamon bark extract has significant antibacterial effects against several types of pathogenic bacteria, including Escherichia coli and Streptococcus pyogenes. The active compounds contained in cinnamon bark, such as cinnamaldehyde and proanthocyanidin, have been shown to have strong antibacterial properties. A study by Reppi and colleagues in 2016 confirmed that cinnamon bark extract produced through a maceration process using 80% ethanol extract was able to inhibit the growth of E. coli and Streptococcus pyogenes. In addition, compounds such as eugenol and cinnamaldehyde were also identified as potential antibacterial agents (Rahayu, et al., 2022).

Although there is some scientific evidence to support the antibacterial effects of cinnamon bark extract, further research is still needed to fully understand its potential use in treating acne. Therefore, this study aims to evaluate the potential of cinnamon bark extract as an ingredient in anti-acne masks and its impact on Staphylococcus aureus bacteria, which is also a common cause of acne. Thus, it is hoped that this research can make an important contribution to the understanding and use of cinnamon as a natural ingredient for effective and safe acne treatment.

In this context, this research not only aims to evaluate the potential of cinnamon bark extract as an ingredient in anti-acne masks, but also to provide a safer and more natural alternative for treating acne. It is hoped that the results of this research can provide a strong scientific basis for the development of skin care products that are effective and safe for the public.

2. Materials and Methods

2.1. Preparation of Dry Extract of Cinnamon (Cinnamomum burmanni)

The process of making dry cinnamon extract is an important stage in this research. The maceration method was chosen because it is considered effective in extracting the active compounds contained in cinnamon. In this process, the use of 96% ethanol solvent was chosen because of its ability to extract active compounds that are soluble in organic solvents. The ratio between cinnamon simplicia and ethanol solvent used is 1:10, which is expected to provide optimal extraction results.

The steps for making the extract begin with the preparation of cinnamon simplicia which is placed in a vessel. Next, ethanol solvent was added to the vessel containing cinnamon simplicia, and during the 3 day soaking period, the solvent was stirred periodically to ensure maximum extraction of active compounds. After the soaking period, filtration is carried out to separate the dregs from the filtrate which contains cinnamon simplicia juice.

The separation process was carried out by adding the remaining ethanol solvent to the dregs, and filtration was carried out again after an additional soaking period of 2 days. The filtrate obtained was then evaporated using a rotary evaporator to remove most of the ethanol solvent and produce a semi-viscous cinnamon extract. Next, the semi-thick extract is dried using the freeze dry method until dry cinnamon extract powder is formed.

This process produces dry cinnamon extract which is expected to have a fairly high concentration of active compounds and can be used in further research to evaluate its potential as an ingredient in anti-acne masks. Thus, the process of making extracts is an important first step in efforts to develop skin care products that are effective and safe for the public.

2.2. Analysis of Simplicia Powder Characteristics

The characteristics of cinnamon simplicia powder need to be analyzed before extraction to ensure the quality of the raw materials used in the research. Water content and ash content are important parameters that need to be evaluated. According to the guidelines issued by the Ministry of Health of the Republic of Indonesia (Depkes RI) in 1985, the maximum water content for cinnamon simplicia is no more than 10%, which is determined using Moisture balance. Meanwhile, the ash content of simplicia powder can be determined using the gravimetric (heating) method, which provides information about the content of minerals and other inorganic materials in the sample.

Cinnamon Extract Phytochemical Test

Apart from physicochemical analysis, phytochemical tests were carried out to determine the content of active compounds in cinnamon extract. Tests were carried out on several groups of compounds, namely Alkaloids, Flavonoids, Tannins and Saponins, which have different pharmacological potential.

a). Alkaloids: The test is carried out using 10% HCl and dilute ammonia. After the cinnamon extract was tested, the white precipitate formed after adding Mayer's reagent showed the presence of alkaloids, while the brown precipitate after adding Dragendorf's reagent also showed the presence of alkaloids.

b). Flavonoids: The test was carried out with magnesium powder, concentrated HCl, and amyl alcohol. The formation of a red, yellow or orange color in the amyl alcohol solution after shaking vigorously indicates the presence of flavonoids in the cinnamon extract.

c). Tannin: The test was carried out with a 1% gelatin solution in 10% NaCl after heating the cinnamon extract in distilled water. The formation of a white precipitate after adding the gelatin solution indicates the presence of tannins in the extract.

d). Saponin: The test is carried out by mixing 100 mg of extract with water and shaking vigorously for 10 minutes. The formation of stable foam for 15 minutes, and remained stable after adding 1% HCl (dilute), indicating the presence of saponin in the cinnamon extract.

This phytochemical test provides important information about the content of active compounds in cinnamon extract, which will later play a role in its pharmacological effects as an ingredient in anti-acne masks.

2.3. Mask Making

a) Mask Base Making:

The mask base is made using the gradual mixing method. The first step is to divide the amylum oryzae into two parts. The first part is used as a methylparaben mixer, while the second part is used as a perfume solvent. The two parts were then put into a mortar together with the addition of ZnO, corn starch and glycerin. All ingredients are stirred evenly to form a homogeneous mask base.

b) Active Ingredient Mixing:
After the mask base is formed, the next step is to mix it with the active ingredients and the remaining corn starch until it reaches the same weight. The mixture is stirred until homogeneous to obtain a mask preparation that is ready for use.

c) Antibacterial Testing
Antibacterial testing is carried out using the perforation method or disc method. Mask preparations containing cinnamon extract were tested, with the positive control using 2% tetracycline, and the negative control using a base without or 0% cinnamon extract. The width of the inhibitory area (LDH) test was carried out on Staphylococcus aureus using the paper disc diffusion method. The concentration used was 0% (w/v) as a negative control, and variations in cinnamon extract concentrations of 8%, 10% and 12% as treatments. Observations were made on the inhibition zone formed, and the width of the inhibition zone was measured to evaluate the antibacterial activity of cinnamon extract.

d) Evaluation of Mask Preparations
Evaluation of mask preparations is carried out using several parameters, including pH measurements, organoleptic tests, stability tests, hedonic/likability tests, and irritation tests. The test was carried out on a cinnamon mask preparation which had been applied to the panelists for 10 minutes. The liking test uses a liking scale from 1 to 4, while the irritation test uses a scale of whether there is irritation or no irritation. This evaluation aims to evaluate the quality and safety of cinnamon mask preparations and receive feedback from potential users.

e) Data analysis
Data on the width of the inhibitory area (LDH) from cinnamon mask powder were analyzed using a completely randomized design with 5 repetitions to determine any differences between treatments. This data analysis aims to evaluate the antibacterial effectiveness of cinnamon extract in mask preparations.

3. Results and Discussion

3.1. Water Content and Ash Content

In this research, fresh cinnamon from the Cinnamomum burmanni species was used as raw material. This cinnamon has been identified and determined by the Herbarium Bogorisense, Bogor. The cinnamon processing process is carried out by making it into powder, where from 3000g of fresh cinnamon, 950g of powder is obtained after a 40 mesh sieve process.

Water content testing was carried out on cinnamon simplicia powder to determine the level of moisture in the material. This test is important to ensure that the water content in the material complies with the established standards, which in this case is no more than 10% according to the guidelines issued by the Ministry of Health of the Republic of Indonesia in 1985. The test is carried out using the "Moisture Balance" tool and is carried out two repetitions with a testing time of 10 minutes each. The test results show that the average water content in cinnamon simplicia powder is 4.44%, which meets the established standards.

The ash content, which is an indicator of the content of inorganic compounds in the material, is also determined. The ash content was measured gravimetrically, and the results showed an ash content of 9.25% for cinnamon powder. The ash content in cinnamon powder is part of the mineral composition of medicinal plants and food ingredients, apart from water and organic materials. Thus, the results of this test provide important information about the physicochemical characteristics of the cinnamon simplicia powder used in this study, ensuring its quality and suitability as a raw material for making anti-acne masks.

3.2. Phytochemical Test Results

Based on the results of phytochemical testing, no steroids were found in cinnamon. However, the test results showed positive presence of alkaloids, flavonoids and tannins. The presence of alkaloids is indicated by the presence of brown precipitates, indicating the potential of cinnamon as an antibacterial agent. Flavonoids were also detected in cinnamon, indicated by the presence of a blackish green color, yellow precipitate, and the formation of an orange color. Flavonoids, as polyphenols commonly found in plants, have a significant influence on antibacterial properties. Apart from that, the test results showed the presence of tannins in cinnamon, which was characterized by a blackish green color and the formation of a white precipitate. This tannin also has antibacterial activity.

3.3. Making Extracts

The extraction process was carried out using the maceration method, where 950g of sample powder was extracted with 9.5 liters of 96% ethanol. The maceration method was chosen because it is simple, easy to do, relatively cheap, and can avoid damage to compound components that are not heat resistant.

The result of the maceration process is a reddish brown extract with a strong typical cinnamon aroma. The yield of cinnamon extract obtained was 300g from the 950g of simplicia used, with a yield percentage of 0.3%. Determination of extract yield aims to determine the amount of extract obtained from a certain amount of simplicia, providing important information about the efficiency of the extraction process. Thus, these results indicate that the extraction process has been successful in producing quality cinnamon extract and has potential as an active ingredient in anti-acne mask formulations.

3.4. Evaluation of Cinnamon Extract Mask Preparations

a). Stability Test
- The stability of the mask preparation was evaluated for 8 weeks at temperatures of 25ºC-30ºC and 40ºC.
- Test parameters include pH and organoleptics. The results of observations from week 2 to week 8 show that the mask preparation still meets good cosmetic standards.

b). Test pH
- The pH of the mask preparation ranges from 5.31-6.89, which is still in accordance with good cosmetic standards.

c). Organoleptic Test
- Texture: Observation results show that the texture of the mask preparation from week 2 to week 8 is relatively smooth.
- Aroma: The aroma of the mask was maintained well during the testing period.
- Color: The color of the mask is relatively stable from week 2 to week 8.

d). Test Likeability
- Based on Aroma: Formula 2 and formula 3 were most liked by the panelists because of the strong cinnamon aromatherapy aroma.
- Based on Color: Panelists did not like the color of formula 1 because it had less influence on the color of the preparation.
- Based on Texture: Panelists did not like the texture of formula 1 and formula 3 because they were less homogeneous compared to formula 2.

e). Irritation Test
- The mask preparation does not cause irritation to the skin after application, indicating that the preparation ingredients do not contain dangerous ingredients.

f). Bacterial Activity Testing
- Antibacterial activity testing was carried out using the disc diffusion method against Staphylococcus aureus.
- Cinnamon extract mask preparation with a concentration of 12% has the most effective activity to inhibit bacterial growth.
- Test results show that the higher the concentration of cinnamon extract in the mask, the higher its effectiveness in inhibiting bacterial growth.

Thus, the evaluation results show that the cinnamon extract mask preparation has good stability, does not cause irritation to the skin, and has effective antibacterial activity against Staphylococcus aureus, making it a potential product for skin care.

4. Conclusion

Based on the data collected from this research, several important conclusions can be drawn:

a). Stability: The cinnamon extract mask preparation showed good stability during a storage period of 8 weeks at room temperature and accelerated temperature. Stability parameters such as pH and organoleptic characteristics remained within acceptable limits throughout the test period.

b). Physical-Chemical Characteristics: The physical-chemical characteristics of the mask preparation, including water content, ash content, and phytochemical tests, meet the specified standards. The presence of active compounds such as alkaloids, flavonoids, tannins and saponins in cinnamon extract shows the potential of this preparation as a cosmetic product with additional activity.

c). Likeability Test: Evaluation of preferences for aroma, texture and color shows that mask preparations with different extract concentrations have varying preferences. However, the formula with a cinnamon extract concentration of 12% showed higher favorability, especially in terms of aroma.

d). Antibacterial Activity: Cinnamon extract mask preparations show promising antibacterial activity against Staphylococcus aureus. An extract concentration of 12% produced the widest inhibition zone, indicating higher effectiveness in inhibiting bacterial growth.

Thus, this study concludes that cinnamon extract mask preparations have the potential to be stable, safe and effective cosmetic products in providing additional benefits in the form of antibacterial activity.

References

Kean, S., Trevanich, S., & Jittanit, W. (2022). Cinnamon essential oil microcapsules made using various methods: Physical properties and antimicrobial ability. *Journal of the ASABE*, *65*(1), 169-178.

Liu, H., Zhao, Z., Xu, W., Cheng, M., Chen, Y., Xun, M., ... & Wang, W. (2023). Preparation, characterization, release and antibacterial properties of cinnamon essential oil microcapsules. *Coatings*, *13*(6), 973.

Muhammad, D. R. A., & Dewettinck, K. (2017). Cinnamon and its derivatives as potential ingredient in functional food—A review. International journal of food properties, 20(sup2), 2237-2263.

Priani, S. E., Mutiara, R., & Mulyanti, D. (2020). The development of antioxidant peel-off facial masks from cinnamon bark extract (Cinnamomum burmannii). *Pharmaciana*, *10*(1), 69-76.

Rahayu, D. U. C., Hakim, R. A., Mawarni, S. A., & Satriani, A. R. (2022). Indonesian Cinnamon (Cinnamomum burmannii): Extraction, Flavonoid Content, Antioxidant Activity, and Stability in the Presence of Ascorbic Acid. *Cosmetics*, *9*(3), 57.