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## Research Article

# Hedonic Test of Sunscreen Cream Formula Made of Cinnamaldehyde of Cinnamon from Timor Island

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## Abstract

**Background and Objective:** One of the potential natural resources in the dry land of East Nusa Tenggara is Cinnamon (*Cinnamomum burmannii*). This plant produces an important bioactive compounds that cinnamaldehyde. The purpose of this study was to examine the preferred value of a sunscreen cream formula made of cinnamaldehyde based on color, odor, consistency, comfort on the skin and the ability to withstand sweat. **Materials and Methods:** The design of this experimental research is a one-shot case study. A total of 30 panelists were treated with a sunscreen cream formula and after that the panelists filled out the prepared questionnaire. The questionnaire was made in the form of a Likert scale of 1-5 for a hedonic test of color, odor, consistency and comfort on the skin. While the sweat resistance test is made on a scale of 1-7. Data analysis is done by calculating the average value of each hedonic test indicator. **Results:** The results showed that the sunscreen cream formula made of cinnamaldehyde from Timor cinnamon has a color, odor and consistency that are in successive categories interesting enough to be attractive, odorless and non-thick and not runny, withstand sweat for 30 min and cause comfort on the skin. **Conclusion:** The sunscreen cream formula gives comfort to the skin based on inherent softness, non-itching and not aching with successive categories gently on the skin, does not cause itching and does not irritate when used.

**Key words:** Hedonic test, cinnamaldehyde, cream formula, sunscreen, *Cinnamomum burmannii*

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

One species of plant that has the potential to produce cinnamaldehyde, namely cinnamon (*Cinnamomum burmannii*). Cinnamon was found growing in West Sumatra, North Sumatra, Jambi and Bengkulu<sup>1</sup>. Cinnamon is found in West Sumatra especially in Agam District and Tanah Datar District<sup>2</sup>. The species of cinnamon in Indonesia is *Cinnamomum burmannii*, with a product in the trading world called *Cassia vera* or *Indonesian cassia*. Cinnamon from mainland China is *Cinnamomum cassia*, its product is called *Chinese cinnamon* and cinnamon from Sri Lanka is *Cinnamomum zeylanicum* or *Cinnamomum verum* with its product called *Ceylon cinnamon*<sup>3</sup>. Especially in Maluku (Ambon and Seram Island) overgrown with *Cinnamomum cullilawan* cinnamon. In East Nusa Tenggara, *Cinnamomum burmannii* grows on the islands of Sumba, Timor and Flores. Heyne<sup>4</sup> suggested that the names of cinnamon in Sumba and Flores were Kaninggu and Puu Ndinga, respectively.

Skin of cinnamon generally used by the community as seasoning spices. Often also used as medicines such as heartburn, diarrhea, sore skin and abdominal bloating. Essential oils from cinnamon have a calming effect and have health benefits such as anti-inflammatory. *Cinnamomum burmannii* can be used as an antibacterial, antifungal, anti-inflammatory, analgesic, antidiabetic, antioxidant, antitumor, antithrombotic, inhibits the formation of dental plaque and periodontal disease and other activities<sup>5</sup>. Chemical compounds that are thought to act as antibacterials on *C. burmannii* are essential oils around 0.5-2% (such as eugenol, safrole, cinnamaldehyde and linalool), polysaccharides about 10% (such as terpenes and coumarin), phenolic components 4-10% (like tannins) and flavonoids. Budiana *et al.*<sup>6</sup>, suggested that cinnamaldehyde isolated from cinnamon bark could inhibit the growth of *Staphylococcus aureus*.

Aside from being an antibacterial, several studies have also shown that cinnamaldehyde from cinnamon is also active as a sunscreen. Research on cinnamaldehyde from cinnamon as a sunscreen has been done. Cinnamon has sunscreen and antioxidant activity because it has cinnamaldehyde<sup>7</sup>. Cinnamic amyl from cinnamaldehyde at a concentration of 25  $\mu\text{g mL}^{-1}$  provided maximum protection against<sup>8</sup> UV-B rays with an SPF value of 12.88. Synthesis of cinnamic hexyl from cinnamaldehyde provides maximum protection against UV-B rays at a concentration of 25  $\mu\text{g mL}^{-1}$  with an<sup>9</sup> SPF value of 14.65. Research from Ngadiwiyana *et al.*<sup>10</sup> showed that cinnamaldehyde was able to produce a maximum SPF at a concentration of 10  $\mu\text{g mL}^{-1}$ , whereas the reaction compounds at a concentration of 6  $\mu\text{g mL}^{-1}$ .

In connection with its ability as a sunscreen, research on sunscreen cream formulas with cinnamaldehyde-based ingredients must continue to be carried out to obtain the right formula that provides maximum protection against UV radiation. Rusita and Suhendriyo<sup>7</sup>, have made 3 sunscreen formulas in the form of a spray gel consists of cinnamaldehyde, carbopol and HPMC. The results showed that the three formulas made did not cause irritation. Ability of cinnamaldehyde as a sunscreen<sup>6</sup>. The results showed that the formula 2 sunscreen made with the basic ingredients of 2 g of cinnamaldehyde had an SPF value of more than 100. While formula 1 and formula 3 had not been tested.

As sunscreens, the sunscreen formula based on cinnamaldehyde must meet several requirements. These requirements include having an SPF of 30 or more, having a broad spectrum (not only can protect the skin from the dangers of UV B but also against UV A) are resistant to water in the span of 40-80 min, do not cause irritation to the skin and have stability were good. To fulfill these requirements, then a sunscreen product in the form of a cream to be tested continuously to improve its quality, causing a sense of comfort for the user. In this study, the researchers focused on studying the formula 3 sunscreen cream made by Budiana *et al.*<sup>6</sup> in the form of a hedonic test to determine the panelists' favorite responses to this product. The hedonic test is very important to be done to find out the preference for color, odor, appearance, the ability of the cream to last by sweat and comfort on the skin. These two things really determine the level of consumer preference for sunscreen. Cream with supra protection even against UV-B rays but the level of preference is low then this product will not be liked by consumers. This research was conducted to obtain the panelists preferred response to the formula of sunscreen cream so that it can be used as a basis for improving the quality of this product.

## MATERIALS AND METHODS

**Location and time of research:** The study was conducted on the campus of FKIP Undana and Bukit Cinta Penfui Kupang for 6 months (May-October 2019).

**Tools and materials:** The tool used in this study consisted of a cotton bud and a refrigerator and the main ingredient was the formula 3 sunscreen cream made from cinnamaldehyde<sup>6</sup>. Sunscreen 3 formula is made by first preparing 2 types of mixture, namely mixture 1 and mixture 2. The mixture 1 consists of 2 g dodecanol, 3 g cinnamaldehyde, 4 g stearic acid, 2 g glycerin. The mixture in the glass beaker is heated in a water bath until the mixture melts. Mix 2 consists of 78 g of



Fig. 1: Sunscreen cream formula

water, 1 g of triethanolamine. The mixture is heated while stirring until a temperature of 80-85°C is reached. After the temperature reaches 80-85°C, the mixture is poured into the mixture container 1 while continuing to stir until homogeneous and smooth fasta is formed. After it is cold, the sunscreen is moved into a bottle with a lid and labeled.

Sunscreen cream formula can be seen in Fig. 1. The sunscreen formula made from cinnamaldehyde is white, odorless, in the form of a cream and when touched it feels soft. According to Pratama and Zulkarnain<sup>11</sup>, cream is a semi-solid dosage form that contains one or more dissolved or dispersed ingredients in a suitable base material. In making formula 3 sunscreen use cinnamaldehyde as bioactive materials, acidic fatty stearate as emulsifier and solubilizing agent, dodecanol to make surfactant, triethanolamine as additives and glycerin as a moisturizer<sup>12-15</sup>. The glycerin as a humectant functions to maintain the level of water content in the product or reduce the water evaporation<sup>16</sup>. The addition of glycerin to improve the characteristics of the formula, especially to maintain skin moisture. To improve the characteristics of the desired cream formula, additional ingredients are often added such as preservatives, chelating, thickening, coloring, moisturizing and deodorizing, studied by Lachman, *et al.*<sup>17</sup>.

**Research design:** This experimental study was designed to approach a one-shot case study<sup>18</sup>. Panelists are given treatment with sunscreen formulas and afterwards filled a questionnaire. The hedonic test involves 30 panelists based on the testing requirements of SNI 01-2346-2006 or organoleptic

and sensory panelists ie at least in one test standard is 6 persons or non-standard is 30 panelists. The panelists' preference test for formula 3 is a sunscreen cream consisting of color, odor and consistency as well as comfort and resistance to sweat. According to Yanti, *et al.*<sup>19</sup>, the hedonic test was conducted using a closed interview technique in which panelists were asked to fill in the questionnaire using a scale of grades 1-5. As for the comfort and endurance test with sweat with closed interview techniques after respondents sunbathing and filling questionnaires on a scale of 1-7.

**Data collecting:** In the hedonic test which includes color, odor and consistency and comfort test on the skin including soft stickiness, itching and pain on the skin, panelists were asked to determine their preferences by filling in the prepared questionnaire. This test uses a Likert scale of 1-5. Scale 1 = very dislike (very uncomfortable for a comfort test) and scale 5 = very like (very convenient). Test the ability of sunscreen formula to withstand sweat is also made in the form of questionnaire and filled by respondents after using sunscreen for 45 min. The 30 panelists smearing the cheek with a formula of sunscreen based cinnamaldehyde and walk in the sun (a test done on the clock 10:00 to 11:00 pm). The endurance test for cinnamaldehyde formula was calculated from the appearance of sweat. The ability to withstand sweat in the form of a scale. Scale 1 = washed in 0-5 min, 2 = washed in 6-10 min, scale 3 = washed in 11-15 min, scale 4 = washed in 16-20 min, scale 5 = washed in 21-25 min, scale 6 = washed in 26-30 min and scale 7 = washed in 31 - 45 min. Panelists were asked to circle the scale that they thought was most appropriate.

**Statistical analysis:** Hedonic test data were tabulated and analyzed descriptively to determine the value of preferences based on color, odor, appearance, ability to resist perspiration and comfort late in the skin.

## RESULTS

**Hedonic test based on color, odor and consistency:** Preferred test results based on color, odor and appearance of formula 3 sunscreen cream as presented in Fig. 2.

Based on Fig. 2, the average preference or interest of panelists in the color of formula 3 sunscreen cream at 3.50 with the category between attractive and quite interesting. The odor test based on odor shows that the panelists gave a score of 4.27 or were in the odorless category. While the preference test based on consistency showed that the panelists gave a score of 3.33 or in the category of not thick.

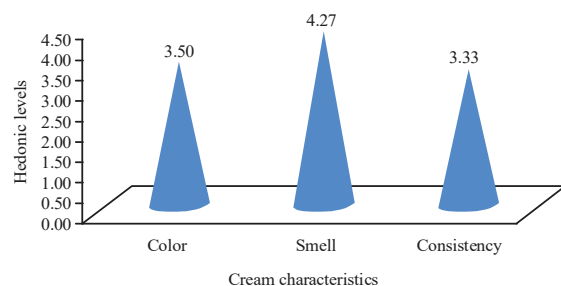


Fig. 2: Relationship between hedonic levels with cream characteristics

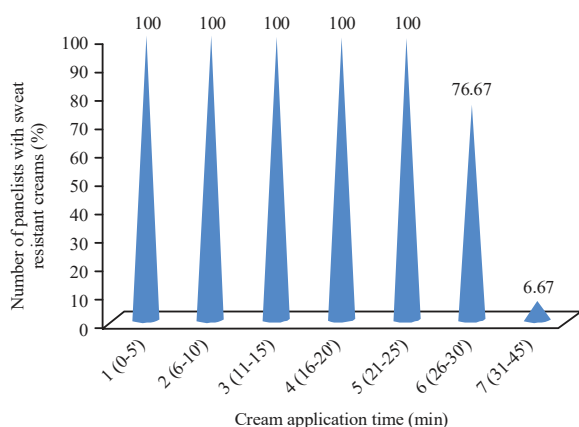


Fig. 3: Relationship between the duration of exposure with the number of panelists whose creams are resistant to sweat

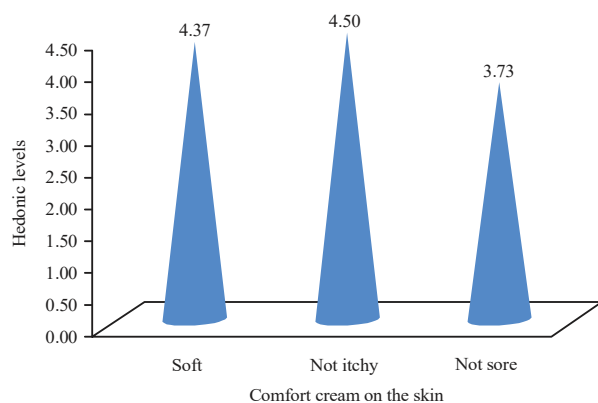


Fig. 4: Relationship between hedonic levels with the comfort of cream on the skin

**Test of sunscreen solubility by sweat:** The results of the endurance test formula sunscreen cream against sweat is presented in Fig. 3.

The results of data analysis show that during the first 25 min, the sunscreens used by all panelists were not washed with sweat or it could be stated that during the 25 min since

the sweat was released, sunscreen made from cinnamaldehyde used by 100% of panelists was not washed with sweat. In the 30th min, the sunscreen formula used by 76.67% of the panelists still survived or was not washed with sweat. Meanwhile, at the 45th min, almost all cinnamaldehyde was washed with sweat or 6.67% of panelists who used a sunscreen formula made from cinnamaldehyde withstand sweat.

**Comfort test on the skin:** Preference test based on comfort on the skin is evaluated based on the softness inherent in the skin, does not cause itching or burning on the skin. The results of data analysis are shown in Fig. 4.

Based on Fig. 4 it was stated that the panelists felt comfortable based on the aspect of softness inherent in the skin with an average score of 4.37 or in the soft category.

## DISCUSSION

The results show that cinnamaldehyde obtained from cinnamon essential oil is clear. In making a sunscreen cream formula using ingredients as mentioned earlier shows that the sunscreen cream formula produced is colorless and does not smell pungent or foul smelling. According to Noweck and Grafarend<sup>13</sup>, dodecanol is a colorless, odorless chemical (so that when added to the mixture it does not cause discoloration or odor. Glycerin is a colorless and odorless clear liquid<sup>20</sup>. Luthfiyana, *et al.*<sup>21</sup>, suggested that pleasant and recognizable aromas are preferred over unpleasant and unrecognizable aromas.

The preference test based on the consistency aspect also shows that the product produced is in the category of not thick and not thin. This means the product aka n l ore is sticky on the skin. A very thick product will stick hard on the skin and this is not liked by the user, on the contrary, the product which is very watery is very easily washed by sweat and this is also not liked by the user. Viscosity is also closely related to the thickness of sunscreen applied to the skin. According to Mbanga *et al.*<sup>22</sup>, that using of sunscreen must be done properly (throughout the body, before sun exposure and reapplied regularly) and in the correct amount, around  $2 \text{ g cm}^{-2}$ . This will provide maximum protection against UV-B.

Based on these three indicators, it can be stated that the panelists liked enough to like the sunscreen cream formula. Good creams have attractive colors, pleasant odors and consistency that is neither too thick nor thin<sup>23</sup>.

The results of the endurance test of the formula 3 sunscreen against sweat are greatly influenced by the

thickness and breadth of the spread of sunscreen cream. The application of sunscreen is  $1 \text{ g cm}^{-2}$ . The amount of sunscreen cream per skin area is smaller<sup>22</sup> than  $2 \text{ g cm}^{-2}$ . This smaller amount of spread is thought to be the reason why sunscreens cannot last longer for sweat. Besides the thickness and breadth of the spread, the durability of sunscreens is also affected by the amount of sweat produced by each individual. Every individual generates a different amount of sweat, depending on the number of the sweat glands and activity physical. In this study a direct test of the effect of sweat on the durability of sunscreens with a time span.

Other testing techniques can be used to test the durability of sunscreens. Pratiwi *et al.*<sup>24</sup> tested the endurance of sunscreen by applying 1 g cream on the palms and then washed with several volumes of water, rinsing hands. Water is passed from the burette slowly while observing the cream on the palm. Next note how much water is used to wash out the cream. This technique illustrates that a good cream is a cream that is not easily washed or requires a lot of water to wash it. testing the washing power of the cream shows that some cream preparations require 10-35 mL to clean 1 g of the cream<sup>25</sup>. This indicates that the cream is easily washed because it has a high water content.

The results of this study illustrate that panelists like the sunscreen formula because it adheres gently to the skin when used. The results of the data analysis also showed that the panelists gave an average score of 4.50 or in the non-itchy category when the panelists used a sunscreen cream formula. The panelists also gave an average score of 3.73 or in the category of not stinging on the veil cream formula. Pratama and Zulkarnain<sup>11</sup>, suggested that sunscreen has satisfying physical properties, for example its stickiness and does not cause toxic, non-irritant and does not cause sensitivity. Furthermore Purwaningsih, *et al.*<sup>26</sup> states that good sunblock creates a feeling of comfort on the skin, is easy to use, suffers, needs active ingredients and homogeneous ingredients, is able to maintain softness and moisture on the skin, is able to absorb UV rays and does not cause redness on skin

## CONCLUSION

Based on the results of the study, it was concluded that the formula for sunscreen made from cinnamaldehyde from cinnamon from Timor has color, odor and consistency in successive categories which are attractive enough, while is odorless, non-thick and not runny. In general, sunscreen cream formulas withstand sweat for 30 min. The sunscreen cream formula gives comfort to the skin based on inherent

softness, non-itching and not aching with successive categories gently on the skin, does not cause itching and does not irritate when used.

## SIGNIFICANCE STATEMENT

This study found hedonic values based on color, odor, consistency, ability to withstand sweat and comfort on the skin. All of these cream characteristics are very beneficial for consumers in choosing a sunscreen cream. This study will help researchers to uncover critical areas of the cream's inability to last longer than exposure to sweat and comfort to the skin when used that have not been explored by previous researchers. Thus, a new theory about the sunscreen cream formula made from cinnamaldehyde cinnamon and possibly other formulas, can be proposed.

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