



# Physical Characteristics and Hedonic Test of Hand Cream with Eucalyptus and Sweet Orange Oil

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**ABSTRACT.** COVID-19 is an epidemic that is being experienced by almost all countries in the world. Several things that can be done to suppress the spread of this disease are frequent hand washing, wearing masks, maintaining distance, avoiding crowds and limiting mobility. However, this regulation also raises some problems. For example, regulations regarding social restrictions that can trigger stress. Increasing the frequency of hand washing can trigger hand dermatitis. Based on these problems, the researchers are interested in developing aromatherapy hand cream products. This product has a dual function, which are as a hand moisturizer and as an aromatherapy product. The purpose of this study was to analyze the physical characteristics and consumer preference level of hand cream with different essential oils, namely 1% eucalyptus oil (HCE) and 1% sweet orange oil (HCO). Parameters of physical characteristics observed included organoleptic, pH, and spreadability. The results of the organoleptic test were analyzed descriptively. Meanwhile, the results of the pH and spreadability tests were analyzed using Independent Sample T-test statistical analysis. In the hedonic test, the parameters assessed were odor, color, and texture. Hedonic test data were analyzed using Mann-Whitney statistical analysis. Based on the physical characteristic test, it was concluded that HCE and HCO have the same visual appearance and spreadability. However, HCE and HCO have different odor and pH. Based on the hedonic test, it was concluded that the scent of HCO is preferred by the panelists than the scent of HCE.

**Keywords:** Aromatherapy · Hand Cream · Eucalyptus oil · Sweet orange Oil

## 1 Introduction

In early December 2019, a new virus was discovered in the city of Wuhan, China. This virus attacks the respiratory system. In some cases, this virus causes pneumonia, acute respiratory syndrome and even causes death [1]. This virus is named SARS-CoV-2, the disease is called COVID-19 (Corona Virus Disease). The spread of this virus is very fast. Therefore, on March 11, 2020, WHO (World Health Organization) declared COVID-19 a pandemic [2].

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The first COVID-19 was reported in Indonesia on March 2, 2020, with 2 cases. This number continues to grow. Data on March 31, 2020 showed that there were 1,528 confirmed cases of COVID-19 and 136 deaths. The COVID-19 mortality rate in Indonesia is 8.9%, this figure is the highest in Southeast Asia [3]. To prevent the spread of this virus from spreading, the Ministry of Health of the Republic of Indonesia issued a policy that all people must comply with health protocols when in public places and facilities. Health protocols that must be adhered to are frequent hand washing, wearing masks, maintaining distance, avoiding crowds and limiting mobility [4]. Although this regulation is considered effective in reducing the spread of the corona virus, this regulation also has several negative impacts. An example is regulations regarding social restrictions that can trigger stress. The results of research conducted by the Association of Indonesian Mental Medicine Specialists (PDSKJI) in the first five months since the Covid-19 pandemic was established in Indonesia, stated that the percentage of people experiencing psychological problems was 64.8%. In the research, psychological problems were found in the 17–29 year age group and 60 years and over. Of the total 64.8%, the most common psychological problems were stress, anxiety, depression, and trauma. Referring to the data obtained from the results of the study, the majority of the group in the age range of 17–29 years are students [5]. Research conducted by [5] stated that as many as 448 students (86%) experienced stress in the normal category, 62 students (12%) experienced mild stress, and 10 students (2%) were under moderate stress. The research was conducted at the Muhammadiyah University of Surakarta.

In addition to social restrictions, the call to wash your hands frequently also creates problems. Increasing the frequency of hand washing can trigger hand dermatitis. In general, hand washing is done using soap and running water or an alcohol-based hand sanitizer. Both of these products can reduce lipids in the stratum corneum. This causes the skin to become more sensitive and irritated [6, 7]. High frequency of hand cleaning and low application of moisturizer can increase the risk of hand dermatitis [6]. So that the use of moisturizer regularly after washing hands is highly recommended.

Based on the problems above, the researchers are interested in developing aromatherapy hand cream products. This product is a product that has multiple functions. The first function is as a moisturizer that is able to restore skin moisture lost due to the use of hand hygiene products. The second function is as an aromatherapy product that can help reduce stress. Aromatherapy comes from the word “aroma” which means fragrance or smell and “therapy” which means treatment [8]. This therapy is a complementary and alternative medicine, widely used in the management of chronic pain, depression, anxiety, insomnia, and stress-related disorders [9]. Aromatherapy uses essential oils as the main therapeutic agent [10]. Essential oils are absorbed into the olfactory and respiratory systems by inhalation or into the transcutaneous system through massage and baths. Inhalation of essential oils sends signals from the olfactory system to the brain, which regulates anxiety, depression, and mood disorders by secreting neurotransmitters such as serotonin and dopamine [9].

The essential oils used as therapeutic agents in this study were sweet orange oil and eucalyptus oil. According to Kim et al. inhalation therapy using eucalyptus oil can reduce anxiety. This is due to the content of 1,8-Cineole in eucalyptus [9]. The results of research conducted by Rashidi-Fakari et al. stated that “Aromatherapy is a noninvasive

and effective method to help women overcome their anxiety during labor. Sweet orange scent can be useful in childbirth units to help women who are experiencing stress in labor” [11]. Research conducted by Hekmatpou et al. stated that “Aromatherapy with sweet orange essential oil reduced pain and anxiety in patients with limb fractures” [12].

As an initial stage, in this research, physical and hedonic characteristics (consumer preference level) were tested for hand cream with 1% sweet sweet orange oil (HCO) and hand cream with 1% eucalyptus oil (HCE). These values were selected based on the literature which indicated that the percentage of addition of essential oils in cosmetic products be between 0.1 and 1% [13].

## 2 Materials and Methods

### 2.1 Materials

The tools used were hand blender (Idealife IL-214), analytical balance (Durascale DAB-E223), glassware, water bath. Meanwhile, the ingredients used were beeswax (Xiamen Fengston Company, Xiamen, China), cocoa butter (Coffee and Cocoa Research Center, Jember, Indonesia), propylene glycol, VCO (Virgin Coconut Oil) (Biocosmetic, Bionnelles, France), phenoxyethanol (THOR, Selangor, Malaysia), Lexemul CS 20 and aquades.

### 2.2 Method

#### 2.2.1 Preparation of Hand Cream

Formula of aromatherapy hand cream can be seen at Table 1 Hand cream made by mixing the oil phase and the water phase using a hand blender. The first step is to prepare an oil phase consisting of solid lipids (beeswax, cocoa butter), emulsifier (Lexemul CS 20) and liquid lipids (VCO). The solid lipids and emulsifiers are melted at a temperature of about 70 °C. After melting, the ingredients are stirred until homogeneous. Then enter the liquid lipid (VCO) which has been heated, then stir until homogeneous. The aqueous phase is also heated at the same temperature (about 70 °C). The aqueous phase consists of propylene glycol and distilled water. The next step is to mix the water phase into the oil phase little by little while stirring using a hand blender. Then added preservative (phenoxyethanol), then stirred until homogeneous. For the HCO formula, 1% sweet sweet orange oil is added. For the HCE formula, 1% eucalyptus oil was added. Then stir again until homogeneous [14].

#### 2.2.2 Evaluation of the Physical Characteristics

The evaluation consists of organoleptic, pH, and spreadability. In the organoleptic test, observations are performed directly on the colors, texture and smells of the hand cream. In the pH test, the sample was diluted using distilled water in a ratio of 1: 9. Then the pH value of the test solution was measured using a digital pH meter. In the spreadability test, 1 g of the test preparation then placed right in the center of the round glass scale. After that, it was covered with transparent glass and was given a load of 100 g. Leave for 1 min, then note the diameter of the spread [14].

**Table 1.** Formula of Aromatherapy *Hand Cream*

Component	Percentage (%)	
	HCO	HCE
Beeswax	2	2
Cocoa butter	20	20
VCO	3	3
Lexemul CS 20	5	5
Propylenglycol	7	7
Phenoxyethanol	0,5	0,5
Sweet orange oil	1	0
Eucalyptus oil	0	1
Aquadest	ad 100	ad 100

\*Based on Mayangsari et al. [14] with modification

### 2.2.3 Hedonic Test

The hedonic test method used is adapted from the testing method that has been done by Mayangsari and the team [14]. Panelists were asked to give an assessment of the odor, color and texture of the 2 test formulas that had been prepared. Panelists were asked to rate it on a scale of 1 to 4 (point 1 for strongly disliked, 2 for disliked, 3 for like, and 4 for strongly like). After that, the data obtained were analyzed statistically.

The subjects used in this test were untrained panelists totaling 20 people with an age range of 19–22 years. The panelists' criteria were willing to be a participant, physically and mentally healthy (no color blindness, no olfactory disorders, no psychological disorders), not smoking, and not using perfume during the test.

Ethical approval for this study was obtained from Universitas Muhammadiyah Lamongan (No. 232/EC/KEPK-S2/01/2022).

### 2.2.4 Data Analysis

The results of the organoleptic test were analyzed descriptively. Meanwhile, the results of the pH and spreadability tests were analyzed using Independent Sampe T-test statistical analysis. In the hedonic test, the parameters assessed were odor, color, and texture. Hedonic test data were analyzed using Mann-Whitney statistical analysis.

## 3 Result and Discussion

### 3.1 Physical Characteristics

The results of the physical characteristics test can be seen in Fig. 1 and Table 2. HCE and HCO had the same color, which was white, but HCE and HCO had different scents. HCE had an eucalyptus scent, while HCO had a sweet orange scent. This is because HCO contains 1% sweet orange oil whereas HCE contains 1% eucalyptus oil.

**Table 2.** Physical characteristics test results

Kind of test	Product specifications	HCE (eucalyptus oil)	HCO (sweet orange oil)	Conclusion
Organoleptic	White color, has a eucalyptus scent (for HCE), has a sweet orange odor(for HCO), soft texture, homogeneous (no separation)	White color, has a eucalyptus scent, soft texture, homogeneous (no separation)	White color, has a sweet orange scent, soft texture, homogeneous (no separation)	Accepted
Spreadability (mean $\pm$ std.error)	3–5 cm	$3.68 \pm 0.881$ cm	$3.70 \pm 0.104$ cm	Accepted
pH (mean $\pm$ std.error)	4.0–6.0	$5.69 \pm 0.009^*$	$5.52 \pm 0.009^*$	Accepted

\*There is a significant difference (according to the independent sample t-test statistical analysis)

The results of the spreadability value test can be seen in Table 2. Based on statistical analysis using Independent Sample T-test, it was concluded that HCE and HCO had the same spreadability value. Sig. (2-tailed) value was 0.909 (more than 0.05). Hence, there is no difference in the spreadability value between HCE and HCO.

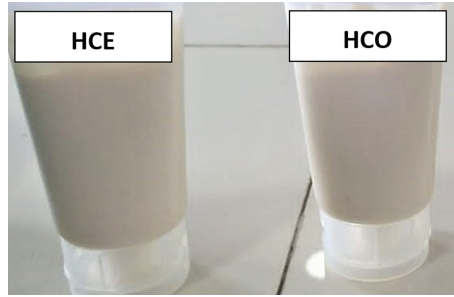
The spreadability of semisolid preparations can be classified into 2 groups, namely semistiff (high viscosity) and semifluid (low viscosity). The spreadability value of semistiff in a range of 3–5 cm. Meanwhile, the spreadability value of semifluid in a range of 5–7 cm [15]. In Table 2, HCE and HCO showed the results of the semistiff type in the range 3–5cm. According to Setiawan and Nurdianti [15], the greater the viscosity value, the smaller the spread power of a preparation.

The results of the pH value test can be seen in Table 2. Based on statistical analysis using Independent Sample T-test, it was concluded that HCE and HCO had the difference pH value. Sig. (2-tailed) value was 0.000 (less than 0.05). That is, there is difference in the pH value between HCE and HCO. HCE had pH value higher than HCO. However, the pH values of the two formulas are still relatively safe because they are in the skin pH range, which is 4.0–7.0 [16]. Lukić and the team [17] explained that the topical products should be acidified and possess pH values in the range of 4–6.

### 3.2 Hedonic

The next step is the hedonic test or the consumer preference level test. Panelists were asked to give an assessment of the odor, color and texture of the 2 test formulas that had been prepared. Panelists were asked to rate it on a scale of 1 to 4 (point 1 for strongly disliked, 2 for disliked, 3 for like, and 4 for strongly like).

This test is very important for cosmetic. The acquisition and continuity of the use of cosmetics are related to the sensation caused by the consumer and can be assessed by



**Fig. 1.** Physical appearance of aromatherapy hand cream with 1% eucalyptus oil (HCE) and 1% sweet orange oil (HCO)

**Table 3.** Average score of hedonic test result

	HCE (Mean $\pm$ std. Error)	HCO (Mean $\pm$ std. Error)
Odor	2.55 $\pm$ 0.135*	3.55 $\pm$ 0.135*
Color	3.20 $\pm$ 0.092	3.25 $\pm$ 0.123
Texture	3.35 $\pm$ 0.150	3.45 $\pm$ 0.114

\*There is a significant difference (according to the Mann Whitney statistical analysis)

sensory analysis or hedonic test. For greater acceptability, it is necessary to develop formulations in accordance with pleasant sensory [18]. Yang and Chen [19] explained that visual appearance of cosmetics product is very important factor to affect consumer preference. Moreover, the aroma of the product also has a considerable influence. Mayangsari and the team [14] explained that an additional 1% jasmine oil in hand cream affects the consumer preference level. In odor assessment, panelist prefer hand cream with 1% jasmine oil than hand cream without jasmine oil.

The average value for the hedonic test can be seen in the Table 3. The results of the hedonic test were analyzed statistically using SPSS 16.0. Testing for normality is often the first step to choosing the correct analytic statistical method. If the assumption of normality is not significant (Shapiro-Wilk test  $p < 0.05$ ), we choose non parametric method. Based on normality test,  $p$ -value of odor, color, and texture was under 0.05. So, the statistical analytic method chosen for analyze odor, color, and texture data was Mann-Whitney.

Based on statistical analysis using Mann-Whitney, the Asymp. Sig. (2-tailed) value of odor aspect was 0.000 (less than 0.05). Hence, there is a difference in the results of the odor assessment between HCE and HCO. Panelists gave a higher value for HCO on the odor aspect. Odor and product preference have positive relationship, which means if the odor is liked by consumer then it is also more preferred by consume [20]. The average value for HCE odor was less than 3. On the contrary, the average value for HCO odor was more than 3. It means that most of panelist prefer the smell of sweet orange to eucalyptus. This statement is similar to the previous study conducted by Ma [21] which

explained that the middle school students preferred the aroma of sweet orange essential oil to the rosemary, lavender, mint, or lemon oil in terms of pleasantness and relaxation.

Based on the statistical analysis using Mann-Whitney, the Asymp. Sig. (2-tailed) of color aspect was 0.676 (more than 0.05). It means that there is no difference in the results of the color assessment between HCE and HCO. The addition of eucalyptus oil or sweet orange oil up to 1% does not make the hand cream have difference color. The average value for HCE and HCO color was more than 3. Therefore, most of panelist likes HCE and HCO color.

The term, "texture" is refers to the set of all geometric and surface rheological and structural properties that can be sensed by tactile mechanical receptors. The panelist must touch the sample for assess texture [18].

On the texture aspect, the Asymp. Sig. (2-tailed) was more than 0.05. it showed that there is no difference in the results of the texture assessment between formulas. The addition of eucalyptus oil or sweet orange oil up to 1% does not make the hand cream have difference texture. The average value for HCE and HCO texture was more than 3 which means that most of the panelist like HCE and HCO texture.

## 4 Conclusion

Based on the results of the evaluation of physical characteristics, it was concluded that HCE and HCO have the same visual appearance and spreadability. However, HCE and HCO have different odorand pH. HCE has a eucalyptus scent, but HCO has a sweet orange scent.

Based on the results of the hedonic test, it was concluded that the scent of HCO is preferred by the panelists than the scent of HCE. Panelist prefer the smell of sweet orange to eucalyptus.

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