

# Moisturizing Lotion Formulation on Tropical Skin based on Cananga Oil (*Cananga odorata*), Kaffir Lime Oil (*Citrus hystrix* DC) and Patchouli Oil (*Pogostemon cablin*) as a Bioactive

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**Keywords:** Cananga Oil, Kaffir Lime Oil, Patchouli Oil, Bioactive, Moisturizing Lotion.

**Abstract:** Indonesia is a tropical country with an average room temperature 37°C and humidity in each region are varies. These conditions make the skin sweat so that the skin loses water. If it left unchecked, it can cause a variety of skin diseases. Proper moisturizer can reduce and prevent damage to the skin. Essential oils have specific bioactive contents such as an antioxidant, anti-inflammatory and antibacterial properties. Previous research has shown that Cananga oil has high anti-bacterial and antioxidant activity (close to 80% ascorbic acid). Citronellal compounds in kaffir lime oil can be used as an antimicrobial and anti-inflammatory. In addition to essential oils, sunflower seed oil is used as a carrier oil to prevent irritation due to high concentrations of essential oils. Sunflower Oil contains oleic and linoleic acids which can improve water absorption in the skin as well as antioxidants. Research on the process of extracting essential oils has been widely carried out, but the use of essential oils that have bioactive content has not been done much. Lotion is one of skin care that is commonly used on the skin. This research aims to get the best formulation in making cananga oil, kaffir lime oil, patchouli oil based lotion which have high antioxidant activity, high hydration effect and good consistency. Essential oils as active ingredients are added with various compositions then formulated and tested in vivo and in vitro. The urgency of this research is to get a lotion formulation from essential ingredients suitable for the skin of the tropics so that later it can be eliminated and support UB especially in welcoming PTNBH. The results showed that the lotion is stabled after stability testing for 7 cycles of cooling 4oC and heating 40°C. The pH test results also indicate that the lotion has a pH between 7.05 - 7.95 which is in accordance with SNI standards. The lotion spread test shows that the greater the load given, the greater the spread diameter of the lotion. The best lotion dispersion is found in Formula V4, W2 with a bio active concentration: base lotion of 1:11,5. For the results of in vitro testing of mice, it was found that there is no lotion formula that causes allergies.

## 1 INTRODUCTION

Indonesia is a tropical country with an average room temperature 37°C and humidity in each region are varies. The hot conditions make the skin sweat so that the skin will lose water. The skin is composed of two layers, namely the epidermis and dermis. The epidermis is selectively permeable, heterogeneous, which protects the skin from dryness and environmental injury and retains enough water to function in a dry environment (Rawling and Harding, 2004). The terms eczema and dermatitis are often

used to describe the same condition. Dermatitis is non-inflammatory inflammation of the skin that is acute, subacute, or chronic, and is influenced by many factors, such as constitutional factors, irritants, allergens, heat, stress, infections, etc. (Daili et al., 2005).

Proper moisturizer can reduce and prevent damage to the skin. One applicative moisturizing product that is commonly used is lotion . The body has a mechanism to protect itself from damage as a result of excess free radicals in the body. However, in certain conditions the body is not able to cope, so it needs additional from outside. Lotion is a material

that can be used to overcome these problems (Faramayuda et al., 2010). Lotion is used as a skin protector that is able to protect from exposure to ultra violet (UV), where the rays that cause free radicals in the skin (Leu et al., 2006).

Essential oils have specific bioactive content such as antioxidants, anti-inflammatory and antibacterial properties. Kusuma et al (2014) evaluated several Indonesian plants used by the interior, one of them is *Cananga odorata*. The results show that *C. odorata* has high anti-bacterial and antioxidant activity. DPPH testing at 50 ppm obtained 80% antioxidant results compared with ascorbic acid.

Main compound of Kaffir lime oil is citronellal. Citronellal compounds (aldehydes) can be used as antimicrobial and anti-inflammatory (Rao, 2006). Warsito et al. (2017) investigated the antioxidant and antimicrobial activity of Kaffir Lime Oil compared to BHT (Butylated hydroxytoluene). IC 50 value of kaffir lime oil compared with BHT was not significantly different.

Patchouli Oil is an essential ingredient in cosmetics because it possesses an antidepressant, antiphlogistic, antiseptic, aphrodisiac, astringent, cicatrisant, cytophylactic, deodorant, diuretic, febrifuge, fungicide, insecticide, sedative, tonic, cicatrisant, cytophylactic, deodorant, stimulants, and euphoric. Patchouli oil can also be used as a fixative (fragrance binder) in the perfume, cosmetics, soap, medicines, and others (Karimi, 2014).

The antioxidant, anti-inflammatory and antibacterial properties of essential oils are very potential to be used as bioactives in moisturizers. Many studies have been carried out on essential properties and essential phytochemicals. However, the existing problems regarding the formulations used in making lotions capable of having antioxidant, anti-inflammatory and high hydration effects with good consistency levels have not been studied.

This research is focused on the use of cananga oil, kaffir lime oil, patchouli oil in various compositions as a bioactive in formulated lotions as moisturizing on tropical skin. The purpose of this study is to get the right formulation in making lotions from active ingredients of antioxidants and anti-inflammatory essential oils. The right formulation for making lotions is able to provide high antioxidant and anti-inflammatory activity for tropical skin.

## 2 MATERIAL AND METHOD

### 2.1 Material

The main raw material in this research are base lotion, cananga oil, kaffir lime oil and patchouli oil. The carrier oil is sunflower seed oil. The main equipment used is overhead stirrer, hot plate, and laboratory glassware.

### 2.2 Method

The first stage of this research is blending the bioactive-oils from essential oils: Cananga Oil (*Cananga odorata*), Kaffir Lime Oil (*Citrus hystrix* DC) and Patchouli Oil (*Pogostemon cablin*). The formulation ratio is shown on Table 1. The blending is started with take each of raw materials in accordance with. The essential oil then put in a stirred tank. Stirring was carried out at a speed of 60 rpm (constant) with a temperature of 60°C to 62°C for 15 minutes.

Table 1: Composition of Essential Oils each Variable

Formulation	Bioactive : base lotion	W1 1:9	W2 1:11,5
	V1 Cananga Oil = 25% Minyak Jerut Purut = 0% Pathouli Oil = 25% Sunflower Seed Oil = 50%		V1,W1
V2 Cananga Oil = 0% Kaffir Lime Oil = 25% Pathouli Oil = 25% Sunflower Seed Oil = 50%		V2,W1	V2,W2
V3 Cananga Oil = 15% Kaffir Lime Oil = 15% Pathouli Oil = 20% Sunflower Seed Oil = 50%		V3,W1	V3,W2
V4 Cananga Oil = 10% Kaffir Lime Oil = 10% Pathouli Oil = 30% Sunflower Seed Oil = 50%		V4,W1	V4,W2

The second stage of this research is making lotions. The ingredients used are stearic acid, glyceril monostearate, glycerol, vaseline, triethanolamine, water and blending Essential Oil (Variable in step 1) which is the active ingredient in the lotion. The principle of making skin lotion is mixing several

ingredients accompanied by stirring and heating. Material is separated into two parts: oil-soluble material and water-soluble material. Ingredients included in the oil phase include stearic acid, glyceryl monostearate, and vaseline. Materials including the water phase include glycerol, triethanolamine, and water. The oil phase is mixed until homogeneous with 70-75°C. heating. The water phase is mixed until homogeneous with 70-75°C. heating. Then both materials are mixed at 70°C. After that, the stirring is continued for 30 minutes at a constant speed to form a skin lotion .

After getting the lotion formulation with various variables that have been written in table 2, then some testing is done, namely :

#### 1. Lotion Stability Evaluation

Test is conducted by way of storing the preparation lotion at a temperature cold 4°C for 24 hours, then removed and placed in a temperature of 40°C for 24 hours, the process is calculated as 1 cycle. This experiment was carried out for 7 cycles. Then the results of the cycling test are compared with previous preparations. It can be observed whether the lotion remains stable in cold condition or at hot temperature.

#### 2. Evaluation of Power adhesive

Test is done by putting 0.25 mL samples of the lotion above 2 glass object that has been determined. Then pressed with a load of 1 kg for 5 minutes. After that, the load is lifted from glass object then glass object mounted on the test equipment. Then, the test equipment was given a load of 80 grams and then recorded the time of release of the cream from the glass object.

#### 3. In Vivo Test

In Vivo Test is a test that is using animals or can be directly on humans in accordance with the rules of the Commission Eligible Ethics Brawijaya University. As many 1mL of lotion is given to the white rat (*Rattus norvegicus*) except the tail. Then it observed for 4 hours.

#### 4. In vitro test

##### a. Measurement of pH and viscosity of lotions

The pH of the lotion can be measured with a digital pH meter (Mettler & Toledo, Giessen, Germany) by inserting a probe into the lotion formulation and leaving it for 1 minute to stabilized. Viscosity measurements were carried out using the Brookfield Viscometer Model RVTDV II (Stoughton, MA). The C-50 spindle is used with a rotation rate of 220 rpm. The gap value is set to 0.3 mm. Temperature was set at 25°C ± 2 and this experiment was repeated three times to obtain statistically significant data.

##### b. Determination of the spreadability and homogeneity

A total of 0.5 grams of lotion is placed with caution on paper charts that coated with plastic transparent, It left for 15 seconds and spacious area that is given by the dosage is calculated. After that, it closed again with plastic and then give a loads with weight 1, 2, and 5 g and left for 60 seconds. The increment area which is given by the dosage can be calculated using the formula ( Voigth , 1994)

#### 5. Organoleptic examination

Fifty person were examined the organoleptic which includes the color, aroma, texture, moisture, viscosity and homogeneity.

## 3 RESULT AND DISCUSSION

### 3.1 Effect of Bioactive in Lotion Stability

Lotion is an emulsion formed by mixing the oil phase and water phase. In guaranteeing lotion products, the emulsion needs to be maintained so that it remains stable or does not form a layer of oil and water. The lotion stability test is carried out in 7 cycles, where in each cycle the lotion is placed in a very cold environment (4 C) and hot environment (40°C) alternately. Figure 1 and Figure 2 shows lotion stability in each cycle.

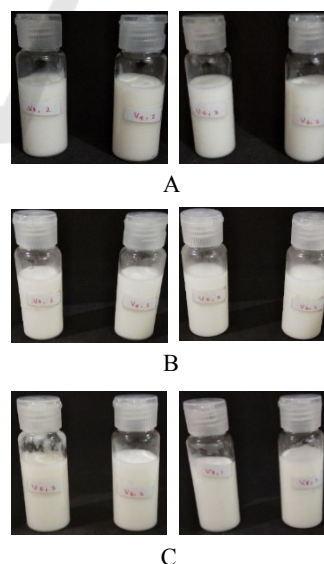


Figure 1: The lotion stability in ((A) Cycle 1, (B) Cycle 2, (C) Cycle 3

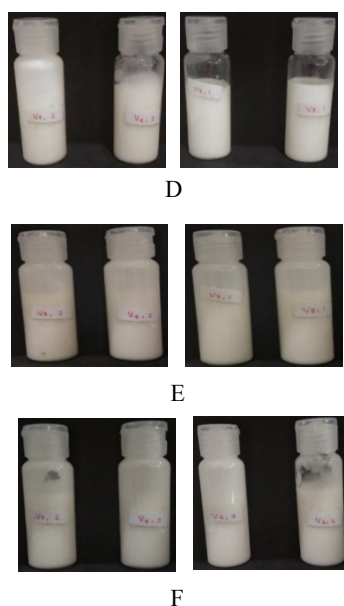


Figure 2: The lotion stability in (D) S cycle 4 , (E) Cycle 5, (F) Cycle 6, (G) Cycle 7

Figure 1. shows the stability of lotions in cycles 1, 2 and 3. It appears that the emulsion lotion does not form a layer, this means that the lotion is stable or homogeneous until the third cycle. Likewise in Figure 6, the lotion in cycles 4, 5, 6 and 7 remains stable and does not form a layer of oil / water. Antioxidants contained in active ingredients can prevent rancidity and discoloration caused by oxidation, besides that antioxidants are able to counteract the absorption of free radicals that can cause damage to the skin (Maysuhara, 2009). Observation from the first cycle to seven showed no change in color or odor. This indicates there are antioxidants that inhibit rancidity and color degradation in the lotion.

### 3.2 Effects of Bio-active Addition on Lotion pH

The pH value of the lotion with the addition of ingredients bio- active with the variables contained in Table 3.1 ranged from 7.0 5 to 7.95 . Based on SNI 164399-1996 the pH value of skin moisturizers ranges from 4.5 to 8.0 (Purwaningsih et al, 2014). The pH value of the lotion still within that range.

The effect of the addition of bio-active on the pH of the lotion is shown in figure 6. From the graph it

also obtained that the highest pH is at variable 4 are 7.95 and 7.93 in the variable W1 and W2.

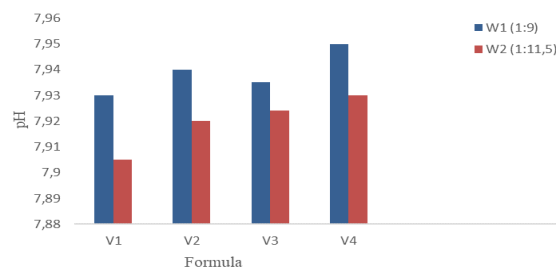


Figure 3: Graph of the effect of adding bio- active to pH lotion .

### 3.3 Effect of Bio-active on the Spread of Lotion

The spread test is used to determine the ability of lotion to spread when applied to the skin. With the addition of load on the lotion, there will be a change in the diameter of its spread. The following is Figure 7 Graph The relationship of load to the spreadability of lotion formulas 1 to formula 8.

From the figure 4 shows that the formula V4, W2 has a dispersive power largest compared to other formulas. The figure also shows that the heavier the load given to the lotion, the wider the spread of the lotion. The thing that causes the difference in the spread of lotion is the comparison of active ingredients with base lotion. By comparison of active ingredients: base lotion of 1: 11.5 at V1, W2; V2, W2 and V4, W2 causes the lotion dispersion ability to be higher. According to Safitri (2014), the higher the spread of lotion, the easier the lotion to be applied to the skin.

### 3.4 In-Vivo Test

The skin is the outer and widest body protector, which serves to protect the body from environmental influences. According to Dr. Ruri D Pamela (2018) there are five characteristics of healthy skin, namely: 1. Clean, not necessarily white, but healthy skin can be seen in plain eyes 2. Evenly colored 3. Good elasticity, 4. Does not feel anything, examples of pain, heat or tenderness and 5. Smooth and soft texture. One way to love the skin is to treat and protect it well. Clean body skin with a clean bath, then apply skin with lotion to keep it moist.

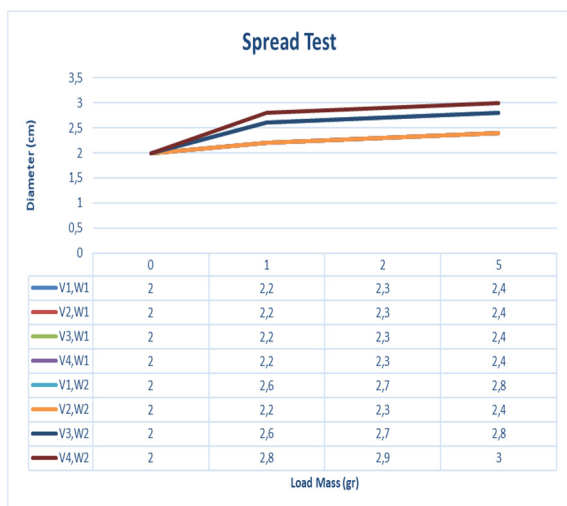


Figure 4: Lotion Scatter Graphic



Figure 5: Figure of lotion testing on mice before and after applying lotion ((a) testing variable lotion 1, (b) testing variable lotion 2, (c) testing variable lotion 3, (d) testing variable lotion 4, (e) testing lotion variable 7.

In this study an in vitro lotion formulation was tested on mice, to see the effect of giving lotion formulations (V1,W1 - V4,W2 ) to the skins of mice. Lotion with formulations (V1,W1 - V4,W2) is said to be an antigen or foreign body that is exposed to mice via the topical that can be seen in the image below this.

The variables observed in this study were inflammatory or inflammatory reactions marked by itching, redness, swelling and heat. From the

observation above we get lotion formulations V1, W1 -V4, W2 do not cause allergic reactions or inflammation in white rat.

#### 4.5 Organoleptic Test

The organoleptic test, we checked the lotion in term of color, aroma, texture, moisture, viscosity and homogeneity. The test have a positive reaction from respondent. More than 50% respondent showed that they like the lotion in term of color, texture, moisture, viscosity and homogeneity.

However, with regard to aroma, respondent gave a variative responses. The most positive reaction is V1,W2 with 24% respondent really like the aroma and 24% like the aroma. Formula V4,W2 is also get a positive reaction with 17% respondent really like the aroma and 35% like the aroma. The most negative feedback is V2,W1 with 28% hate the aroma and 21% really hate the aroma. The reason respondent hate the aroma is due to the aroma is too pungent and not familiar.

### 5 CONCLUSIONS

Based on the results and discussion it can be concluded as follows:

1. The antioxidant activity of bioactive can prevent the lotion from rancidity, destabilization of the emulsion and discoloration.
2. The addition of bioactive to the lotion can provide anti-inflammatory effects in experimental animals.
3. The best formula of lotion is V1,W2 in terms of pH, spreadability, in vivo test and organoleptic test.

### ACKNOWLEDGEMENTS

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