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# Physical Appearance of Commercial Herbal Eco-Green Soap Bar Combination of Madeira Vine Leaf Extract and Citronella Oil

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***Abstract***

*Herbal Eco-green soap is made by saponification using cold or hot process soap that reacts the lye with vegetable oil (soap base) and herbal components. Coconut oil is a vegetable oil that gives a nice hardness and foaming to the soap bar. There are two types of coconut oil on the market, namely coconut oil without a filtration process (unrefined) which contains more fatty acid, and that has been filtered (refined) which contains less fatty acid. The free fatty acid from vegetable oil that is not saponified would affect the mushy soap and the rancid smell because of any matter that is not saponified. The herbal extract added would affect the soap's organoleptic and homogeneity. In this study, the organoleptic, homogeneity, and foam stability of the physical appearance of the herbal eco-green soap bar was evaluated for the better choice of coconut oil as a base herbal soap. The soap bar was made by cold process and there were four group formulas. Herbal soap with base soap and herbal component combination of Madeira vine leaf extract with citronella oil (F1 and F2) and base soap with coconut oil without herbal component (F3 and F4). Formula 1 and 3 use refined coconut oil and F2 and 4 use nonrefined coconut oil. The study results that the herbal l soap was mushy and looked greener than the base soap. Herbal soap with non-refined coconut oil was more homogeneous (F2) and formula 3 was the hardest soap with white colour. All formulas had moderate foam stability.*

***Keywords:*** *Coconut oil, Soap bar, anredera cordifolia, citronella oil*

## 1. INTRODUCTION

Commercial soap has high value and interest from consumers if has a good physical appearance from the color, smell, and foam. Eco-green soap or natural soap is an eco-friendly soap and does not damage the environment like synthetic surfactants such as sodium lauryl sulfate or atrium dodecyl sulfate [1]. Synthetic surfactant would irritate the skin, skin allergies, and pain [2]. Natural or organic soap was used the vegetable oil and the lye to make the base soap. Natural soap bars did not irritate the skin because of any glycerine in the soap [3]. In soap bar making occurs saponification reaction, the triglyceride in the vegetable oil would react with sodium or potassium hydroxide and produce fatty acid-salt as polymeric surfactant and glycerine. The saponification process could occur with or without heating. Cold process soap without heating was to be a choice to make a good appearance of the soap from the shape after unmolding the soap. In this method was easier to add the fragrance or colorant to the mixture of the soap than with hot process soap. So the soap after unmolding looked homogeneous. The heating process made the soap mixture more thick and difficult to add and mix the additives and the soap would be not homogeneous [4].

There are two kinds of fatty acids, saturated and unsaturated fatty acids, and the soap's hardness depends on it. Vegetable oils like palm oil, coconut oil, and virgin coconut oil could be used as a source of saturated fatty acid and make hard soap [5]. Olive oil, avocado seed oil,

sunflower seed oil, and grape seed oil were sources of unsaturated fatty acids and would produce mushy soap [6]. Besides the soap's hardness, the foaming of the soap depends on the oil in the oil mixture too [7]. Coconut oil is one of the vegetable oils would give hardness and good foaming for soap bars [8]. The saturated fatty acid like lauric acid in coconut oil produces more hardness in the soap bar than the unsaturated type like oleic acid in olive oil [9]. Moreover, the foam of the soap bar would give much if using coconut oil as the base soap[10].

Coconut oil in the market has two kinds, refined coconut oil filtered oil for minimalizing the fatty acid, and unrefined coconut oil which has more free fatty acids than refined coconut oil [11]. It would make a difference between both saponification values was the number of milligrams of the alcohol needed to neutralize or saponify the fatty acid in 1 gram of oil. The free fatty acid in the soap that is not saponified would affect the appearance of the soap like the shape that is more mushy and difficult to unmold after 24 hours of molding. Besides that, the free fatty acid would make a rancid smell in long-term storage.

Medicinal plant extract as an herbal component could added to natural soap to cure some skin problems. The plant extract or essential oils could give different pharmacological effects depending on the chemical constituent contained in it. The leaf extract of Madeira vine (*Anredera cordifolia* (Ten.) Steenis ) or Binahong in Indonesian had antibacterial, antiinflammation, and wound healing properties that could be added to the soap between 1 until 2 % [9], [12]. Ethanolic extract of Madeira vine could repair skin irritation via skin cell proliferation because of any chemical constituent like flavonoid [13]. Saponin in water extract of Madeira vine leaves would make stable foam for a better soap bar appearance[2]. Citronella oil is *Cymbopogon nardus* was used as a repellant and could be used as a topical application in a massage oil with a concentration from 1% to 10%. It could prevent mosquito bites and other insects. Concentration of oil more than 10% would cause skin irritation [14]. Citronella oil also has antibacterial and antifungal properties for the skin [15], [16]. A combination of two herbal components, which were Madeira vine leaf extract and citronella oil would increase the soap's efficacy but would affect the appearance of the finished product like organoleptic and homogeneity [17]. Commercial base soap more the opportunity for the soap formula to use simple ingredients, or just use 1 kind of oil like coconut oil. The literature in this study used two kinds of coconut oil refined and unrefined coconut oil as the base soap bar using sodium hydroxide as the lye, with and without herbal components. Evaluation occurs organoleptic, homogeneity, and foam stability as the physical appearance of the soap.

## 2. MATERIALS AND METHODS

### *2.1. Materials*

Coconut oil brand “LUMANTAR”, Leaf of Madeira vine (*Anredera cordifolia* (Tenore) Steen), Citronella oil, sodium hydroxide, aqua dest

### *2.2. Tools*

Macerator, Rotary evaporator, water, Mixing machine, Glassware, thermometer, ruler, plastic mold

### *2.3. Preparation of raw material*

The Madeira vine leaf extract is made by the maceration method and maceration 2 times, 250 grams of Madeira vine powder soaked in 1250 mL ethanol 96% for 24 hours with stirring for 30 minutes in the first and the end of maceration. Then, the extract was filtered and the extract evaporated with a rotary evaporator and water bath until thicked. Citronella

oils were made by the distillation method from the supplier. The Madeira vine ethanolic extract is mixed with citronella oil for better solubility in coconut oil (herbal component). Soap is made with saponification reaction using Sodium hydroxide as lye and reacts with fatty acid in coconut oil. The product of the reaction is glycerine and soap. Soap is made by adding lye solution in oil and stirring until the trace stage the mixture of the solution looks thick. In this stage, the herbal component was added and stirred again until the mixture was homogenous. After that, the mixture is poured into the mold and left for 24 hours until the soap gets the solidity. Solid bar soap is evaluated in a three-parameter that consists of organoleptic, homogeneity, and foam stability. There were four groups in Table 1.

**TABLE 1**. Grouping and composition of formula

| Composition | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| Madeira vine ethanolic extract | 1% | 1% | - | - |
| Citronella oil | 1% | 1% | - | - |
| Refined Coconut oil | 50 gram | - | 50 gram | - |
| Unrefined Coconut oil | - | 50 gram | - | 50 gram |
| Lye | 9,15 gram | 9,15 gram | 9,15 gram | 9,15 gram |
| Water | 17,3 gram | 17,3 gram | 17,3 gram | 17,3 gram |

### 2.4. Organoleptic test

This test is done by looking at the shape, texture, color, and aroma of the soap. The bar soap was observed for the color that occurred and whether there was a rancid aroma from the oil [18].

### *2.5. Homogeneity test*

This test is carried out by looking at the results of making soap and whether the mixture of ingredients is homogeneous as seen from the color homogeneity. One bar of soap was observed for the color of each surface. If the color looks the same on each side, it shows that the soap is homogeneous

### *2.6. Foam stability*

A total of 1 gram of soap bar was put into a test tube added with 5 mL of distilled water and shaken vigorously until the foam was formed. The foam stability was measured over the next 40 minutes.

## 3. RESULTS AND DISCUSSION

The maceration method produces 5,445-gram ethanolic extracts of Madeira fine leaf from 250 grams of powder (2,178%). After 24 hours of unmolding, the soap bar weight rate was 72,5 grams. Evaluation of the soap could be looked at in Table 2 and Figure 1. Based on the picture, the organoleptic of F1 and F2 using herbal components (Madeira vine leaf ethanolic extract and citronella oil) have a green color with low homogeneity that extract precipitated at the bottom of the soap. Nonherbal soap at F3 and F4 just a base soap not using herbal components looks white with F3 more white than F4. Formula 3 and 4 get more better solid than Formula 1 and 2. Formula 3 was the perfect molding for that nonherbal component and just using refined coconut oil as the base soap. All of the soap formulas have moderate foam stability with 2 cm foam stable in 25 minutes.

(a)

(b)

**FIGURE 1**. Organoleptic and Homogeneity view of F1: Herbal with refined coconut oil (A), F2: Herbal with unrefined coconut oil (B), F3: Non Herbal with refined coconut oil (C), and F4: Non Herbal with unrefined coconut oil (D)

**TABLE 2.** Organoleptic, homogeneity, foam stability of group formula

| Group | Description Group | Organoleptic | Homogeneity | Foam stability |
|---|---|---|---|---|
| F1 | Herbal + refined coconut oil | green color, aromatic smell, soft | + | ++ |
| F2 | Herbal + unrefined coconut oil | green color aromatic smell, more soft and mushy | ++ | ++ |
| F3 | Nonherbal, refined coconut oil | white color, sweet smell, soft | +++ | ++ |
| F4 | Non herbal, unrefined coconut oil | white-porcelain color, sweet smell, softer | +++ | ++ |

Madeira vine contains phytochemical constituents such as alkaloids, saponins, flavonoids, steroids, and tannins. The green color of the soap comes from the chlorophyll in the ethanolic extract of the Madeira vine [19]. Geraniol from the citronella oil was the terpenoid group that contributed to the aromatic smell [20]. Formula 3 had a sweet smell from the coconut oil [21]. The color differences were influenced by the fatty acid in the coconut oil. Refined coconut oil soap in F3 has less fatty acid so the color looks white than the unrefined coconut oil soap in F4.

A higher amount of fatty acid would make porcelain color. The foam could be more stable if any saponin is in the extract [19]. Saponin is more soluble in polar solvents than in semipolar solvents. In all formulas, the extract is made using the ethanol 96% has moderate polarity so saponin is just low extracted.

The texture of the mushy soap was attributed to the higher amount of fatty acid in unrefined coconut oil, so the soap looked more soft. The homogeneity of the soap in F1 and F2 was low because of any herbal component that was not saponified and there was low solubility in refined coconut oil. Despite that, the unrefined coconut oil with more amount of fatty acid would facilitate the homogenization of herbal components in the saponification process.

## 4. CONCLUSION

Refined Coconut oil as a soap base makes the soap color more white than unrefined coconut oil. Herbal soap which consists of Madeira vine ethanolic extract and citronella oil that have low polarity could be more homogenous with coconut oil unrefined as a soap base because of the high fatty acid in that oil. So, if the soap formulation consists of low polarity compounds like herbal ethanolic extract, coconut oil unrefined is suggested used for the base soap. However, refined coconut oil could be better for nonherbal ethanolic extract or just using the essential oil and polar coloring. The foam stability was good for all groups and soap alkalinity with a pH value of 10 qualified in SNI 3532. It's recommended to carry out further research related to levels of free alkali, unsaponified matter, ethanol unsoluble matter, free fatty acid, and moisture content.

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