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Formulation and Evaluation of Patchouli Oil Gel for Burn Wound

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ABSTRACT: Essential oil of the patchouli leaves (*Pogostemon cablin*, Benth) was known has the antibacterial effect and could be used to treat burn. The aim of this study is to formulate patchouli oil into a gel dosage form. Patchouli oil was used at three concentrations i.e. 2% (F1), 4% (F2) and 6% (F3). Evaluation of the resulting formulas includes examining its general appearance, homogeneity, skin irritation test, pH and spreadability test. Based on the evaluation data, it was found that gel with 2% patchouli oil was transparent. The greater the concentration of patchouli oil, the more opaque the gel is produced. The other parameters give results that are not different for the three formulas.

Keywords: patchouli (*Pogostemon cablin*) oil; gel; burn wound.

Introduction

Patchouli essential oil is one of the biological resources that produce oil of patchouli by distillation of patchouli leaves [1, 2]. Patchouli oil contains patchouli alcohol which is the main compound of patchouli oil. The patchouli oil also contains eugenol, cinamaldehyde, benzaldehyde and cadinene [1, 3, 4].

Patchouli oil plays an important role in the perfumery and cosmetics industry. In the fragrance industry, patchouli oil is used as a fixative (binder aroma). Patchouli oil can treat several skin problems as an antiseptic, acne medicine, antifungi, eczema and dried skin. In addition, as well as other volatile oil, patchouli oil can also be used as aromatherapy [1, 5].

One of the plants that are empirically able to heal burns is patchouli. It has been applied to the skin by rubbing the patchouli oil or leaves that have been pounded on the injured skin. This essential oil will accelerate healing when applied to the burn wound [6].

Burns is a tissue damage caused by contact with hot objects, electrical and radiation. Damage caused by burns can come to the subcutaneous tissue, dermis and epidermis depends on the length of exposure to the causative factor [7-9]. Burns are usually expressed by degrees, depending on the extent of tissue damaged by burns proficiency level [10]. At burns, body fluids such as water and serum will be out. This condition is a good medium for microbial growth. Therefore, patients with burns should receive special treatment [9].

In previous studies, patchouli showed inhibitory to bacteria and can reduce the inflammation. Patchouli oil has been formulated in to face soap with a concentration of 0.5% and 1% [11]. Patchouli oil can accelerate tissue regeneration by stimulate the formation of new skin layer. In wound healing, patchouli oil does not only play a role in accelerating wound healing but also prevents scarring [6]. Patchouli oil also has a strong adhesion. Major compound of patchouli oil is patchouli alcohol. This compound experiences an activity against *Staphylococcus aureus* and *Bacillus subtilis* [12, 13]. Both of these bacteria are mostly found in burns [14]. Based on the activity and its ability to regenerate the new skin, then patchouli oil is developed as a remedy for burns.

Gel is a semisolid dosage form consists of dispersion system. This dispersion is composed of small inorganic molecules or large organic molecules [15-17]. Gel dosage form has several advantages such as simple preparation, easy washed with water, and can provide a cooling sensation on the skin because the more water contents and more attractive appearance than cream dosage form [17-19]. But if the ingredients used are not soluble in water, gel produced will not transparent [18, 20].

Methods

Materials

Patchouli oil is obtained from West Sumatera, Indonesia. Carbopol 940 (Total equipment®),

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Tween 80 Glycerin, Triethanol amine (TEA) were bought from Brataco Chemical®. Bioplacenton® was used as standard.

Formulation of Patchouli Oil Gel

Table 1. Patchouli Oil Gel Formula

NO	Ingredient	Gel		
		F1 (%)	F2 (%)	F3 (%)
1.	Patchouli oil	2	4	6
2.	Tween 80	15	15	15
3.	Carbopol 940	0.5	0.5	0.5
4.	TEA	0.5	0.5	0.5
5.	Glycerin	10	10	10
6.	Distilled water up to	100	100	100

Patchouli Oil Gel Preparation:

Carbopol 940 was dispersed in distilled water. Then added TEA and stirred gently to form a gel mass. Furthermore, added glycerin and patchouli oil that had been mixed with Tween 80. The preparation was stirred until homogeneous [17].

Evaluations

General Appearance [15, 21]

Consistency, texture, color, odor and transparency of the samples were done visually.

Homogeneity [15, 21, 22]

All formulas were tested for homogeneity by visual inspection after the samples were dispersed on a slide of object glass. They were tested for their appearance and presence of any aggregates.

Skin Irritation Test [15, 22]

Skin irritation test have done on humans volunteers. For each formula, five volunteers were selected and 0.1 g sample was applied on an area of 2 square inch to the inner upper hand then covered with gauze. The volunteers were observed for irritation and other symptoms after 24 hours.

pH Measurements [22, 23]

The pH of all formula was determined by using digital pH-meter (Accumet Basic AB15).

Spreadability Test [21, 22]

0.5 g of each formula was placed on a transparent glass repose graph paper. Then covered with transparent plastic and given a certain load (1, 3, 5 and 7 g) for 60 seconds. The increasing of diameter was measure after being given the load.

Results and Discussion

Patchouli oil was formulated into gel dosage forms because the process of preparation the gel is relatively easy, attractive appearance, their cooling effect on the skin due to the evaporation of water [18]. Carbopol 940 was used as gel base. Carbopol 940 has good characteristics that provide a transparent gel base and a high viscosity at low concentrations [24]. The concentration of carbopol 940 used as a gelling agent is 0.5-2% [25]. This study used a concentration of 0.5% as based orientation conducted. Carbopol 940 with concentrations greater than 0.5% will form a gel with high viscosity. Glycerin is used as a humectant in the gel [25]. Tween 80 was used as surfactant to lower the surface tension between the patchouli oil and gel base that mostly contain water. The concentration of tween 80 used as a surfactant agent is 1-15% [25]. Therefore, in this study attempted to use a tween 80 at a concentration of 15%. Formula F1 that contain patchouli oil 2% produce transparent gel. Increasing the concentration of patchouli oil would produce opaque gel. This is due to the amount of tween 80 was not enough to dissolve the patchouli oil.

The results of the general appearance, homogeneity and irritation test of patchouli oil gel could be seen in Table 2. All formula were observed during 6-week and there were no change in terms of general appearance, color and odor during storage. All formulas were homogeny and not irritant.

Table 2. General Appearance, Homogeneity and Irritation Test Results

Formula	General Appearance	Homogeneity	Irritation Test
F1	Semisolid	Good	Nil
	Specific Odor		
	Transparent White		
F2	Semisolid	Good	Nil
	Specific Odor		
	Opaque White		
F3	Semisolid	Good	Nil
	Specific Odor		
	Opaque White		

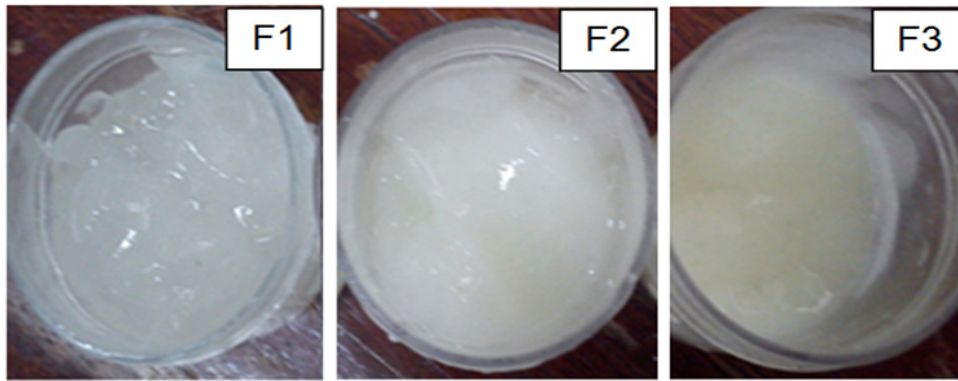


Figure 1. Physical appearance of patchouli oil gel

Results of patchouli oil gel pH probe using Carbopol gel base 940 for each formula that is F1 ranged from 6.3 to 6.5, ranging from 6.3 to 6.4 F2, F3 ranging from 6.2 to 6.4. Results of pH measurement for 6 weeks showed a decrease and an increase in pH which tends not too big for storage so it can be concluded that the preparation of a thermodynamically stable and the absence of either a chemical reaction caused by the storage container or the materials contained in the preparation. pH test results using a base of patchouli oil gel Carbopol 940 gel for each formula that is F1 ranged from 6.3 to 6.5, ranging from 6.3 to 6.4 F2, F3 ranging from 6.2 to 6.4.

The results of the test checks the power spread

patchouli oil stocks for each formula indicates the greater concentration of patchouli oil, the higher the power spread. Spreadability test aims to see the spread of the preparations when applied to the skin. This test were performed using extensiometer method, which is done manually by calculating the gain broad principle given by preparation at a particular time if the given load with a certain weight [26]. In the gel formulation using carbopol base 940, viscosity decreases with increasing concentration of active substance. This is due to the patchouli oil itself is fluid, so that with increasing concentrations of the active substance, the consistency of the gel is also more dilute.

Table 3. PH of Patchouli Oil Gel

Formula	pH at week						Mean
	1	2	3	4	5	6	
F1	6.4	6.4	6.5	6.4	6.3	6.5	6.42
F2	6.4	6.4	6.4	6.3	6.3	6.4	6.37
F3	6.3	6.3	6.3	6.4	6.2	6.3	6.30

Table 4. Spreading Test Results

Formula	Spreading (cm ²)			
	1 g	3 g	5 g	7 g
F1	0.04	0.16	0.42	0.84
F2	0.08	0.22	0.64	0.96
F3	0.10	0.26	0.70	1.14

Conclusion

Gel with 2% patchouli oil was transparent. The greater the concentration of patchouli oil, the more opaque the gel is produced. The other parameters give results that are not different for the three formulas.

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