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Formulation and Physical Evaluation of Cream containing Neem Oil 5%

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ABSTRACT

Permethrin Cream 5%, a topical scabicidal agent, is usually used for the treatment of infestation with *Sarcoptes scabiei* (scabies). Nowadays, neem oil, a vegetable oil pressed from the fruits and seeds of the neem (*Azadirachta indica* A.Juss), is reported having an antiscabies effect. The aim of the study was to formulate and evaluate the physical properties of cream containing neem oil 5%. Methods of the study were characterization of physicochemical properties of neem oil, preparation and physical stability study at room temperature (25 °C) and 40 °C for three months storage of the neem oil 5% cream. Physical evaluation involved organoleptic, homogeneity, pH, tipe of cream and viscosity. The study results showed that all of the physicochemical properties of neem oil met the requirement. The cream were white to yellowish white, characteristic neem oil odor, homogenous cream, pH ± 8, viscosity approximately 2000-8000 cps and o/w cream. Three months storage of the cream showed that the formula resulted a stable cream physically.

Keywords: neem oil, permethrin, scabies, *Azadirachta indica* A.Juss

1. Introduction

Scabies, one of the infectious skin diseases, can infect more than 130 million people every year globally [1]. Scabies is caused by infection of the female mite *Sarcoptes scabiei var hominis*. The mites live and deposit eggs into the skin. The symptoms of scabies are due to an allergic reaction to the mites [2].

The highest incidence rate of scabies occurs in tropical countries, high population and low socio-economic condition [1-5]. Scabies is the 3rd of 12 common skin diseases in Indonesia [6,7]. Scabies can occur in both men and women, in all age groups, races and social classes. The mite caused scabies can travel from the infected person to another person and can be transmitted through direct or indirect physical contact with the patient [8]. The mite can survive for about 2 to 3 days at room temperature and average humidity [2].

First line therapy of scabies is 5% permethrin topical cream [9] but the price of the permethrin cream is quite expensive. This is a problem of scabies treatment for the patient with low economy. Anti-scabies cream containing neem oil is an approach to solve the problem.

Neem oil is a vegetable oil pressed from the fruits and seeds of the neem (*Azadirachta indica* A.Juss). Neem oil had been used as anti-parasite and anti-scabies [10-12]. Previous research reported that the use of paste containing mixture of neem oil and turmeric in scabies patients showed a 97% improvement in 814 patients after 3 to 15 days of therapy [13]. The effectiveness of neem oil for anti-scabies had also been tested using clinical trial before and after the use of cream and showed clinical cure [14]. Scabies can be treated systemically or topically. The systemic treatment is only indicated for the treatment of severe scabies.

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Topical treatment is the main choice for scabies therapy [15].

2. Method

2.1. Physicochemical test of neem oil

Neem oil used in this study came from PT. Happy Green Pakar Barat No. 3, West Jakarta, Indonesia. Physicochemical properties of the neem oil was checked to ensure its originality. The physicochemical properties determined were organoleptic, specific gravity, refractive index, acid value, iodine value, peroxide value, and saponification value. The result of the physicochemical properties determination was compared to the specification at certificate of analysis and literature specification. The organoleptic was done by visually observing the consistency, color and odor of the neem oil. Specific gravity and refractive index was determined using picnometer and refractometer ABBE, respectively. Acid, iodine, peroxide, and saponification value was calcute using titration method.

2.2. Formulation of cream

Formulation of the cream was done by mixing the vanishing cream base and neem oil 5%. Cream formula is listed in table 1.net

Table 1. Formula of cream

Ingredients	F1
Neem Oil (% w/w)	5
Adeps Lanae (g)	1
Stearic Acid (g)	14.2
Glycerin (g)	10
Sodium Tetraborate (g)	0.25
Triethanolamine (g)	1
Nipagin (% w/w)	0.1
Aquadest (g)	75

2.3. Preparation of cream

The cream were made by mixing the water component (glycerin, sodium tetraborate, triethanolamine, nipagin and aqua destillata) and oil component (adeps lanae, and stearic acid) which had been heated at 60-70^{o}C under stirring using super mixer (Erweka). Furthermore, neem oil was added and stirred until the homogenous cream was formed . The cream was packaged into divided containers for three months physical stability study.

2.4. Physical stability study of cream

The physical evaluation was done at room temperature (25 ^{o}C) and at 40 ^{o}C. Physical evaluations involved organoleptic, homogeneity, pH, type of cream and viscosity were done at day-0, 7, 14, 21, 30, 60 and 90. The organoleptic and homogeneity evaluations were done by visually observing the consistency, color and odor of the cream. pH and viscosity were determined respectively using pH meter and Brookfield viscometer. Type of cream was checked visually using methylen blue solution. The evaluation was done triplo (n = 3) and the data was presented in average ± standard deviation.

3. Result

3.1. Physicochemical test of neem oil

Physicochemical properties determination results of neem oil were listed in Table 2.

3.2. Formulation and Preparation of cream

The cream were prepared using safonification method. Stearic acid was reacted to triethanolamine (TEA) and emulsifying agent (TEA-stearat) was formed. This emulsifying agent caused the mixing of oil phase and water phase and formed a white to yellowish white, neem characteristic odor, homogenous cream, pH ± 8, viscosity approximately 2000-8000 cps and o/w cream.

3.3. Physical stability study of cream

The result of physical evaluation of cream was shown in table 3.

4. Discussion

4.1. Physicochemical test of neem oil

Table 2 showed that all of the physicochemical properties of neem oil used in this study met the specification. Specific gravity is one of the important criteria in determining the quality and purity of oil content. Specific gravity is affected by the degree of unsaturation and the molecular weight of the oil. The greater average of fatty acid molecule is in the oil, the greater specific gravity is found [16,17]. The refractive index is used for oil purity testing. The refractive index values are influenced by the fatty acid component of the vegetable oils, the free fatty acid content, the oxidation process and the temperature. The longer carbon chain and the more double bonds will increase the value of the refractive index [18].

Acid value is used to measure the amount of free fatty acids present in oil or fat. The higher fatty acid content is in the oil, the lower quality of the oil is got because it will speed up the process of rancidity [19]. Iodine value represents the degree of unsaturation of oil or fat. The greater of iodine value is checked, the higher degree of unsaturation is in the oil , and the higher the quality of the oil is resulted. Peroxide value is used to determine the degree of oil or fat damage. Saponifiaciton value represents the size of the fat molecule. The greater saponification value is in the fat or oil, the smaller it is molecule. All of the test results showed that physicochemical properties of neem oil met the literature specification [19].

4.4. Formulation and preparation of cream

The cream preparations were white to yellowish white, neem characteristic odor, homogenous cream, pH ± 8, viscosity approximately 2000-8000 cps and o/w cream.

4.5. Physical stability study of cream

Organoleptic and homogeneity test was done

Table 2. Physicochemical properties results of neem oil

Physicochemical properties	Specification	Result
Organoleptic	Brown colored, oily liquid with a neem characteristic odor [a]	Brown colored, oily liquid with a neem characteristic odor
Specific gravity (T = 30°C) (g/cm^3)	0.908-0.934 [a]	0.920
Refractive index (T = 40°C)	1.4615-1.4705 [a]	1.4700
Acid value (meq/g)	< 40 [a]	21.62
Iodine value (mg/100g)	65-80 [a]	79.65
Peroxide value (meq/g)	< 20 [a]	17.84
Saponification value (mg/g)	175-205 [a]	190.3 [b]

[a](www.neemuses.com)
[b](Certificate of analysis)

Table 3. Odor, colour, homogeneity and type of cream after three months storage at room temperature (25 °C) and 40 °C (n=3)

Day	Odor	Colour	Homogeneity	Type of Cream
0	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
7	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
14	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
21	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
30	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
60	Neem characteristic odor	Yellowish white	Homogenous cream	o/w
90	Neem characteristic odor	Yellowish white	Homogenous cream	o/w

by visually observation involved odor, color, and consistency of cream. This was done to find out the cream made in accordance with the color and odor of the oil used and to result a homogenous cream.

The observation result of the tests either at room temperature (25°C) or at 40 °C showed that cream containing neem oil was stable in organoleptic and homogeneity for 90 days of storage.

The neem oil cream should have a pH in accordance with the topical preparation pH range (5.5-10) so it does not cause irritatition on the skin and may increase user acceptance. Fig. 1 showed that pH of the cream was approximately 8 and met the pH specification for topical preparation. The pH of the cream was stable for three months storage (Fig.1).

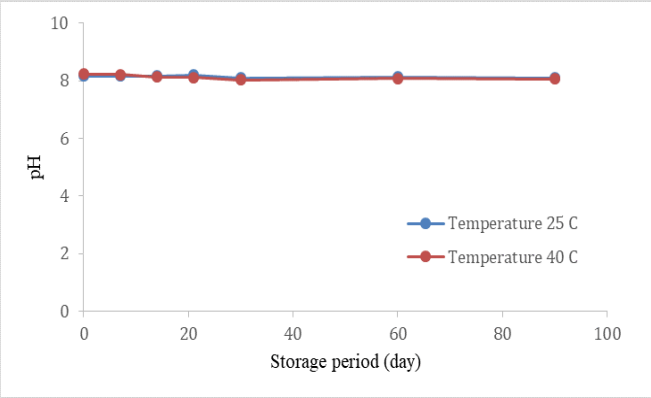

Figure 1. pH of cream after three months storage (n=3)

Viscosity test using Brookfield viscometer was performed to check the cream viscosity. The viscosity of the cream preparation should be in accordance with the criteria required by SNI 16-4399-1996 (2000-50.000 cPs). During 90 days of storage, Fig. 2 showed that the cream viscosity was in the range 2000-50.000 cPs. It means that the viscosity of the cream met the requirement required by SNI 16-4399-1996.

The type of cream was determined using the phase dilution method and the color method. The result showed that type of the cream was oil in water (o/w) and it was stable on storage for 90 days at room temperature (25 °C) and 40 °C (Table 3).

Physical stability study result of the cream containing neem oil showed that the cream was stable in organoleptic, homogeneity, pH, type of cream and viscosity after three months storage at room temperature (25°C) and 40 °C. This result indicates that the cream potentially developed as anti-scabies cream using neem oil as an active ingredient. Long term and accelerated stability study is needed to prove the physical stability of the cream containing neem oil [20].

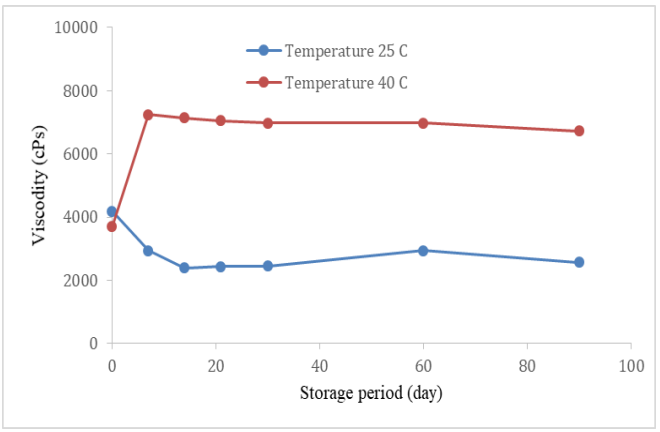

Figure 2. Viscosity of cream after three months storage (n=3)

5. Conclusion

The physicochemical properties of neem oil met the requirement and three months storage of the cream showed that the formula resulted a stable cream physically. Cream containing neem oil is potentially developed as an anti-scabies preparation.

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