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Formulasi NLC-Stick Ekstrak Bunga Telang (*Clitoria ternatea* L.) Dengan Variasi Konsentrasi Shea Butter dan Asam Stearat

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ABSTRACT
NLC of telang flower extract has an effect as a sunscreen to protect the skin from sunlight. Stick preparation in NLC formulation can facilitate the use of sunscreen. This study aims to determine and compare variations in the concentration of Shea Butter (as a Base) and stearic acid (as a Harding Agent) and obtain the results of physical evaluation of variations in the concentration of Shea butter and Stearic Acid. NLCs of telang flower extract were formulated into formulas with varying concentrations of shea butter and stearic acid in the ratio of 80:20; 50:50; 20:80. Furthermore, the physical properties of NLC-Stick of bay flower extract were evaluated, including organoleptic test, homogeneity test, pH test, melting time test, and spreadability test. The results showed that the optimal variation of shea butter and stearic acid concentration was 50:50. The optimum formula of NLC-Stick of telang flower extract has a colour like the active substance, solid shape, soft aroma, homogeneous, pH of 4.56 ± 0.3, melting time test of 21 minutes, and spreadability test of 3 cm. NLC-Stick with varying concentrations of shea butter:stearic acid (50:50) has a physical evaluation that meets the stick requirements.
Keywords: NLC-Stick, telang extract, shea butter, stearic acid

ABSTRAK
NLC ekstrak bunga telang memiliki efek sebagai tabir surya untuk melindungi kulit dari sinar matahari. Sediaan stick pada formulasi NLC dapat mempermudah penggunaan tabir surya. Penelitian ini bertujuan untuk mengetahui perbandingan variasi konsesntrasi Shea Butter (sebagai Basis) dan asam stearate (sebagai Harding Agent), memperoleh hasil evaluasi fisik variasi konsesntrasi Shea butter dan Asam stearate. NLC ekstrak bunga telang diformulasikan ke formula variasi konsentrasi shea butter dan asam stearate dengan perbandingan 80:20; 50:50; 20:80. Selanjutnya dievaluasi sifat fisik NLC-Stick ekstrak bunga telang meliputi uji organoleptis, uji homogenitas, uji pH, uji waktu leleh, dan uji daya sebar. Hasil penelitian menunjukkan variasi konsesntrasi shea butter dan asam stearate yang optimal yaitu 50:50. Formula optimum NLC-Stick ekstrak bunga telang memiliki warna seperti zat aktif, bentuk yang padat, beraroma lembut, homogen, pH sebesar 4,56±0,3, uji waktu leleh sebesar 21 menit, dan uji daya sebar sebesar 3 cm. NLC-Stick ekstrak bunga telang denganvariasi konsentrasi shea butter:asam stearate (50:50) memiliki evaluasi fisik yang memenuhi persyaratan stick.
Kata kunci: NLC-Stick, ekstrak bunga telang, shea butter, asam stearate

1. Introduction

Telang flower is a plant from the fabaceae family that has various benefits such as anti-diabetesbetes, antiobesity, anti-inflammatory, and photoprotector. In addition, telang has various compounds, such as flavonoids, phenolics, alkaloids, terpenoids, and has high antioxidantsantsants. [1] The flavonoid content in telang has the potential as a sunscreen because there is a chromophore group that can absorb light at UV wavelengths. [2]

Sunscreen is a substance that can protect the skin from exposure to ultraviolet rays from the sun. Telang flower extract has conjugated double-bonded compounds that are able to absorb UV radiation. Telang flower extract is made in the NLC formula because the use of organic sunscreens can be degraded by UV radiation, thus reducing effectiveness. [3] Previous research has examined telang flower extract cream, which

has an SPF value of 12, while previous research on NLC of telang flower extract has an SPF value of 19.94 ± 1.1 in the ultra protection category. [4] This can prove that the use of carrier systems such as NLC can increase the effectiveness value of a sunscreen with the same concentration of active substances.

In the use of NLC, for the convenience of application as a sunscreen so as not to decay due to the semi-liquid form of NLC and facilitate reapplication, a solid preparation is needed, one of which is in the form of a stick. Stick formulations are relatively new preparations that are used topically. In previous studies, NLC-Stick formulations have been carried out, but they have shortcomings in evaluating their physical properties.[5] These shortcomings are caused by the large use of stearic acid as a harding agent. harding agent is one of the important excipients for making sticks as a hardener in the preparation.[6] Therefore, this study was conducted to determine the optimal formula for NLC-Stick by comparing variations in the concentration of stearic acid as a harding agent and shea butter as a base with a ratio of 80:20; 50:50; and 20:80, respectively.

2. Methods

2.1 materials

The materials used in this research are stearic acid (Multi Jaya Kimia), aquadest (PT. Nusa Kimia Indonesia), telang flower extract (Pontianak, Indonesia), cetyl palmitate (Multi Jaya Kimia), nipagin (PT. Nusa Kimia Indonesia), parfume (PT. Nusa Kimia Indonesia), propylene glycol (PT. Nusa Kimia Indonesia), shea *butter* (*Cosmetic Grade*), tween 20 (Multi Jaya Kimia), vitamin E *oil* (Multi Jaya Kimia).

The tools used in this research are stirring rods, petri dishes, watch glasses, beaker glasses (Iwaki Pyrex), gelas ukur (Iwaki Pyrex), homogenizer (IKA RW-28), *magnetic stirrer* (Ma-H280-Pro), neraca analitik (Ohaus Pioneer PX224/e), pH meter (HANNA), dropper, turtle spoon, stainless spoon, sonicator (Branson 2800), vial, wadah *stick*.

2.2 Formulation of NLC telang flower extract

The preparation of NLC starts with the lipid phase (solid lipid and liquid lipid) being melted to a temperature of 60℃±5℃. Meanwhile, the aqueous phase is made by mixing surfactant and distilled water. The water phase is introduced into the lipid phase to form a pre-emulsion mixture. The pre-emulsion was homogenized with an ultra turrax homogenizer at 800 rpm for 5 min followed by ultrasonication using a sonicator for 10 min. The NLC dispersion was cooled to room temperature (25±1℃). [7]

Table 1. Formula NLC Stick ekstrak bunga telang

Materials	usability	Concentration (%)
Telang flower extract	Active substance	5
Cetyl palmitate	Solid lipids	8.3
Vitamin E oil	Liquid lipids	5.3
Tween 20	Surfactants	21.2
Propylene glycol	cosurfactants	10
nipagin	preservatives	0.03
Aquadest	solvents	Ad to 100

2.3 Formulation of NLC-Stick telang flower extract

The stages of making NLC stick preparations of bay flower extract are melting stearic acid and shea butter using a hot plate, stirring until the temperature reaches 60 ± 5 ° C. Next, NLC of bay flower extract is added and stirred until homogeneous. then perfume and nipagin are added and stirred again until homogeneous. After that, it was poured into the mold and allowed to solidify at room temperature.[8] NLC stick formula of telang flower extract is in Table 2.

Table 2. Modified Formulation of NLC Stick of Telang Flower Extract

Materials	Usability	F1(%)	F2(%)	F3(%)
NLC telang Flower Extract	Active Substance	70	70	70
Shea *Butter*: Stearic acid	Base:Harding agent	30 (20:80)	30 (50:50)	30 (80:20)
Parfume	Fragrance	0.01	0.01	0.01
Nipagin	preservative	0.03	0.03	0.03
Aquadest	Solvent	Ad to 100	Ad to 100	Ad to 100

2.4 Evaluation of NLC-stick of telang flower extract

2.4.1 Organoleptic test

Organoleptic tests are carried out with the five senses, namely colour, aroma, texture, and shape. A Table stick has a colour that matches the active substance, an appropriate aroma, a soft texture, and a solid shape.[5]

2.4.2 Homogeneity Test

The homogeneity test is carried out to see whether the preparation has been mixed perfectly or not. NLC preparation of telang flower extract stick is applied to transparent glass in 3 (three) parts, namely the centre, top, and bottom. It is observed whether or not there are coarse grains or lumps[9].

2.4.3 Spreadability test

The spreadability test is carried out by taking 0.5 grams of stick and then placed on a flat glass. Then, it was covered with glass of the same size and weighed 130 grams. Qualified spreadability has a size, which is 3 - 5 cm. [10]

2.4.5 Melting time test

The stick melting time test is carried out by inserting one stick into the container, and then the water temperature in the beaker glass is controlled at 36.5ºC by inserting an auxiliary thermometer to check the water temperature in the beaker glass. Then record the time it takes for the stick to melt completely."[11] The qualified melting time is no more than 30 minutes."[12].

3. Result and Discussion

3.1 NLC telang flower extract

NLC of telang flower extract was obtained based on the formula used in the previous study. In the previous study, the values of pH, % transmittance, % absorption efficiency, and particle size using this formula were 6±0.1, 88.31±1.2, 99.84±0.02, and 256.4 nm, respectively. These values fall within the requirements of a good NLC.

Figure 1. NLC telang flower extract

3.2 NLC-Stick ttelang flower extract

NLC-Stick, in this study, uses shea butter as a base because it has a softening effect or as a skin moisturizer. [13] In addition to shea butter, NLC-Stick of telang flower extract uses a harding agent that functions as a solid form giver in stick preparations. This study uses stearic acid as a harding agent because stearic acid is better than cera alba. Stearic acid will remain solid both before and after storage, while cera alba produces a solid stick preparation before storage and after storage melts. In addition, the melting point of cera alba is lower than stearic acid. The melting point of cera alba is 61 - 65 ℃, and that of stearic acid is 69 - 70 ℃[6].

In the manufacture of NLC-Stick, the NLC of telang flower extract was inserted after heating, this is so that the compounds in the NLC are not damaged by heating. The NLC-Stick in this study was made by comparing the concentration of shea butter and stearic acid by 20%:80%, 50%:50%, and 80%:20% in 30% shea butter and stearic acid. The results obtained based on the comparison can be seen in Figure 2.

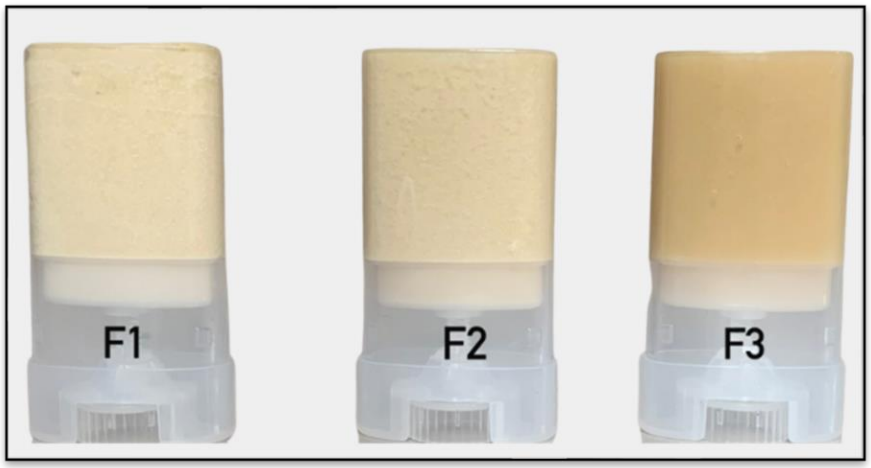

Fig 2. Variation of concentration of NLC-Stick of telang flower extract with shea butter and stearic acid ratio F1(20%:80%), F2(50%:50%), F3(80%:20%)

3.3 NLC-Stick evaluation of telang flower extract

3.3.1 Organoleptic test

Organoleptic test is carried out to determine the condition of the preparation visually. This study conducted an organoleptic test, which included colour, aroma, texture, and shape. The results of the organoleptic test can be seen in Table 3.

Table 3. Organoleptic evaluation results

formula	colour	scent	texture	shape
F1	Light brown	Soft	Soft	Solid
F2	Light brown	Soft	Soft	Solid
F3	Brownish-yellow	Soft	Soft	Solid

3.3.2 Homogeneity test

The homogeneity test is carried out with the aim of seeing whether the preparation is homogeneous or not. The preparation can be said to be homogeneous if there are no lumps at the time of testing. In this study, F3 did not meet the requirements, this could occur due to the use of a smaller harding agent compared to the base. Meanwhile, F1 and F2 have no lumps. The results of the homogeneity test can be seen in Figure 3

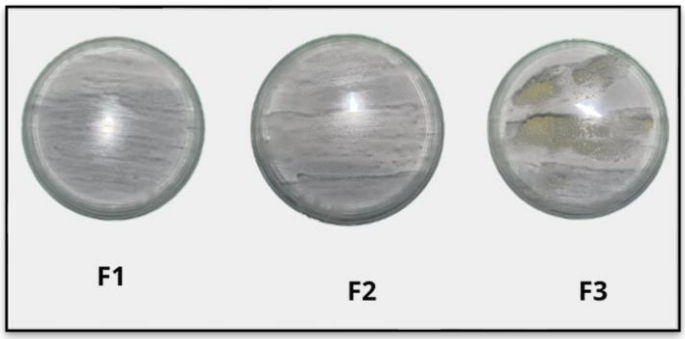

fig 3. Homogeneity test result

3.3.3 pH test

The pH test is carried out to measure the acidity and basicity of preparation, especially topical preparations.[1] The pH of the preparation has requirements in accordance with the pH of the skin, which is 4.5 - 6.5.[14] The pH test was carried out in the same way as the NLC pH test of telang flower extract. The results of pH measurements in this study that fall into the pH range of human skin are F2 and F3. F1 does not meet the requirements. The pH test results show that F1 does not meet the pH requirements of the preparation. This is due to the large use of stearic acid. stearic acid is able to reduce pH to acid. This is in line with the results of this study. pH test results can be seen in Table 4.

Table 4. pH evaluation results

formula	Rep 1	Rep 2	Rep 3	Average $\pm SD$
F1	4.3	4.3	4.2	4.26±0.05
F2	4.53	4.56	4.6	4.56±0.03
F3	4.5	4.6	4.67	4.59±0.08

3.3.4 Spreadability test

The spreadability test is carried out to determine the softness of the stick preparation so that it can see the ease of applying the preparation to the skin. Good spreadability causes contact between the drug and the skin to be wider so that skin absorption becomes wider. In this study, the results of the qualified spreadability test were F2 and F3, with results of 3.2 cm and 3.7 cm, respectively. while the formula that did not meet the requirements was F1 with a result of 2.6 cm. this can occur due to the use of harding agents that are used very large, so that the spreadability is smaller. Good spreadability has a size of 3 - 5 cm [10].

3.3.5 Melting time test

The melting time test is carried out to determine the time required for the preparation to soften at a certain temperature. in this study, the time required for the preparation to melt in F1, F2 and F3 was 32 minutes, 21 minutes, and 18 minutes, respectively. This time is included in the melting time requirements for stick preparations, namely F2 and F3. Melting time can be said to be qualified if the preparation melts no more than 30 minutes. This is needed to determine the melting time that is reached perfectly for the release of the active substance for stick preparations. [12] Previous research had a melting time of 17 minutes. Melting time can be influenced by the harding agent, the more the concentration of harding agent, the harder and longer the melting time required [15][16].

4. Conclusion

The conclusion that can be drawn from this research is that the optimal concentration variation ratio of shea butter and Stearic acid is 50:50. The results of the physical evaluation at a concentration of 50:50 meet the requirements of the stick, which is light brown in colour, soft in aroma, soft in texture, and solid in shape. pH obtained was 4.56 ± 0.03. The spreadability test obtained was 3.2 cm. and the melting time test obtained was 21 minutes.

5. Acknowledgement

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6. Conflict of Interest

The authors declare that they have no conflict of interest.

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