FORMULATION OF LOTION PREPARATION FROM BASIL LEAF EXTRACT (*Ocimum basilicum*) AS AN ANTI-MOSQUITO REPELLENT

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A B S T R A C T

Basil plant (*Ocimum basilicum*) is one of the traditional medicinal plants known to have various properties. Basil leaves (*Ocimum basilicum*) contain compounds such as saponins, flavonoids, tannins and essential oils, where flavonoids have toxic properties through their sharp aroma. The purpose of this study was to determine the formulation of making basil leaf extract lotion (*Ocimum basilicum*) as a mosquito repellent, using the maceration method. The results of the study showed that formula 1 preparation did not have basil leaf extract (*Ocimum basilicum*) so that in this preparation the skin was often infested by mosquitoes, formula 2, namely the preparation that had basil leaf extract (*Ocimum basilicum*) 1% in this preparation mosquitoes still landed on the skin, formula 3, namely the preparation that had basil leaf extract (*Ocimum basilicum*) 3% in this preparation mosquitoes were rarely or few landed on the skin and formula 4 with basil leaf extract (*Ocimum basilicum*) 5% in this preparation mosquitoes did not land on the skin. In this study basil leaf extract (*Ocimum basilicum*) can be an anti-mosquito lotion formula. A good and effective lotion as an anti-mosquito is found in formula 4 with basil leaf extract (*Ocimum basilicum*) 5%. The test results met the physical stability test requirements, but not for the spreadability test, with formula 4 as the most effective with 5% active substance.

INTRODUCTION

Dengue fever is an acute disease caused by the dengue virus, with the increasing number of sufferers requiring efforts to control the vector population, namely mosquitoes. (Ramayanti *et al* ., 2017) . It is important to note that some viruses can cause serious symptoms (Rahayu *et al* ., 2023). Mosquitoes have become the main factor causing Dengue Hemorrhagic Fever (DHF) in tropical and subtropical countries, including Indonesia. One practical method to control mosquitoes is to use lotion. Lotion is a preparation consisting of one or more active ingredients, in which there is an oil phase and a water phase stabilized with an emulsifier (Yanti *et al* ., 2020) .

Indonesia has a wealth of medicinal plants that have not been used optimally for health. Traditional medicine really needs to be preserved in order to develop and support efforts to improve public health. (Teheni *et al* ., 2023). The use of natural ingredients as medicine is considered better because the side effects are relatively lower than modern synthetic drugs (Yolandari *et al* ., 2022). One of the traditional medicinal plants used as a natural insecticide is basil leaves (*Ocimum basilicum*) (Aulia *et al.* , 2019) . Basil plants were originally found and processed in India. Currently, this plant has spread widely in Asia, as well as Central and South America, and is widely found in Sumatra, Java, and Maluku (Linn *et al* ., 2015) . Previous studies have found that basil leaves are plants that have many benefits (Wahid *et al.* , 2020) . Basil leaf extract (*Ocimum basilicum*) contains flavonoids, saponins, and tannins. Flavonoid compounds can function as poisons through their pungent aroma, while saponins can damage the mosquito's digestive system. In addition, tannins can reduce the effectiveness of digestive enzymes, thereby reducing the ability of mosquitoes to digest food (Klencki & Nelemans, 2018) .

Basil leaves (*Ocimum basilicum*) can be used as herbal supplements because their phenolic content has antioxidant activity, with essential oils as the main component (Nugroho *et al* ., 2023) . Phenolic compounds in basil can damage microbial membranes and disrupt potassium ions in cells, which causes damage to the cytoplasmic membrane (Aulia *et al.* , 2019) . In addition, basil leaves also contain flavonoids, saponins, tannins, and essential oils (Kumalasari & Andiarna, 2020) . Essential oils generally consist of two components, namely hydrocarbons and oxygenated hydrocarbon derivatives (phenols), which have strong antibacterial properties. (Angelina *et al* ., 2015) . Flavonoids can cause yellow, red, orange, blue and purple colors in both fruits and leaves which are often found in plants (Arbiyani *et al* ., 2022) . Saponins can inhibit the growth of bacteria and fungi and function as

plant protection from insect attacks (Surahmaida & Umarudin, 2019) . Tannins as a type of polyphenol, limit the absorption of nutrients needed by insects, so that their nutritional needs are not met (Ramayanti *et al* ., 2017) . In addition to having antibacterial properties, basil leaves are also useful in fighting free radicals. This is due to its antioxidant content which is considered good for inhibiting free radicals that enter the body (Cahyani, 2014) .

Extraction is a method used to obtain soluble chemicals, by removing them from insoluble materials with liquid solvents. The purpose of this extraction process is to isolate chemical compounds found in plants (Senduk *et al* ., 2020) . Maceration is an extraction procedure by obtaining materials with reasonable solvents separating strong mixtures with low or no heating (Suharto *et al* ., 2016).

According to previous research by (Klencki & Nelemans, 2018) , dengue fever transmission can be controlled by controlling the mosquito population. Insecticides or toxic chemicals can be used to kill insects. One of the traditional medicinal plants that can be used as a natural insecticide is basil leaves .

METHOD

Research Design

This study uses the type of laboratory experimental research. The sample used is basil leaves (*Ocimum basilicum*). The method used in this study is the maceration method.

Time and Place of Research

This research was conducted on July 16 - July 24, 2024 at the Pharmacognosy-Phytochemistry Laboratory of Mandaya Waluya University and the Pharmacy Laboratory of Baubau Polytechnic.

Tools and materials

The equipment used includes stirring rods, bunsen, blender, petri dish, porcelain dish, separating funnel, evaporator, erlenmeyer, gegep, beaker, measuring cup, watch glass, object glass, label paper, filter paper, mortar and pestle, pH meter, dropper pipette, volume pipette, spatula, horn spoon, lotion container, sample storage container, analytical balance and 60 mesh sieve. The materials used in this study were distilled water, 96% ethanol, basil leaf extract (*Ocimum basilicum*), stearic acid, olive oil, cetyl alcohol, triethanolamine (TEA), glycerin and nipagin.

Formulation

Table 1. Formulation of Basil Leaf Extract Lotion (*Ocimum basilicum*)

	Formula				Utility
	F1	F2	F3	F4	
Basil leaf extract	-	1	3	5	Active ingredients
Stearic Acid	15	15	15	15	Emulsifier
Olive Oil	5	5	5	5	Moisturizer
Cetyl Alcohol	4	4	4	4	Emulsifier
TEA	4	4	4	4	Emulsifier
Glycerin	15	15	15	15	Moisturizer
Nipagin	0.12	0.12	0.12	0.12	preservative
Aquadest ad	100 mL	100 mL	100 mL	100 mL	Solvent

Source: Yanti *et al* ., 2020

Information:

F1: Base without extract

F2: Extract 1%

F3: Extract 3%

F4: Extract 5%

Work Procedure

Processing of Basil Leaf Samples (*Ocimum basilicum*) (Marcellia *et al* ., 2021)

The basil leaves taken are fresh and old leaves, then the basil leaves are washed with running water until clean, then chopped and dried by airing, the drying time depends on the weather, the dried samples are ground with a blender, then sieved with a 60 mesh sieve to get the desired results.

Making Basil Leaf Extract (*Ocimum basilicum*) (Ambari, 2021)

Before making the extract, weigh 500 grams of basil leaf powder (*Ocimum basilicum*) which is then stored in a container for maceration. Next, 96% ethanol is added until all the simplicia are

submerged and left for two times 24 hours in a closed container. After that, the basil leaf extract is filtered to separate the residue from the filtrate. The filtrate obtained is then put into a separating funnel to separate the extract from the solvent. To obtain a thick extract, an evaporator is used on the basil sample. The basil leaf extract that has been obtained is then stored in a prepared container. This extract is ready to be used for the process of making mosquito repellent lotion .

Lotion Making Formulation

Before making the first lotion, all the ingredients are weighed. The oil phase consisting of stearic acid, olive oil and cetyl alcohol is heated at 60-70 ° C until melted. The aqueous phase, consisting of distilled water and TEA (triethanolamine), is heated to the same temperature in a separate vessel. Next, mix the distilled water with glycerin and TEA and stir until smooth. The water phase mixture is then dissolved into the oil phase while stirring at 60 ° C, followed by the remaining distilled water. Nipazine is added at 40 ° C and the mixture is left at room temperature to form the base of the lotion. Add the concentrated basil leaf extract according to the treatment and stir until smooth. The finished lotion is poured into bottles and labeled.

Formula Testing

Organoleptic Test

Organoleptic testing by examining the physical form of the lotion preparation. The examinations carried out consist of shape, odor and color (Yanti *et al* ., 2020) .

pH Test

The pH test is carried out using a pH meter, then the pH meter is dipped into the mosquito repellent lotion that has been dissolved using distilled water, then the results are observed. Skin pH measurements include physiological between 4.5-6.5 (Kristianingsih & Febriana, 2022) .

Homogeneity Test

The sample is applied to a glass slide, then covered with another glass slide. After that, the particles are observed visually to see their distribution. A good quality lotion should produce a homogeneous composition, that is, no solid material is felt on the glass slide (Kristianingsih & Febriana, 2022) .

Spread Power Test

Spreadability testing uses an object glass and a weight. The sample is placed on the object glass, then pressed with a weight. After that, the spread diameter is measured. A good lotion shows a spreadability value in the range of 7-16 cm (Juniyanti *et al* ., 2021)

Anti Mosquito Test

The anti-mosquito test was conducted by four testers. Formula 1 lotion was applied to the hands and feet of tester 1 before going to bed for about 8 hours, while formula 2 was applied to tester 2 before going to bed for about 8 hours, formula 3 was applied to tester 3 before going to bed for about 8 hours and formula 4 was applied to tester 4 before going to bed for about 8 hours. After that, the effect of the lotion as an anti-mosquito was observed.

RESULTS & DISCUSSION

Based on the results of the research that has been carried out, the lotion formulation from basil leaf extract (*Ocimum basilicum*) as a mosquito repellent showed the following results:

Organoleptic Test

Organoleptic tests include three aspects of observation, namely color, aroma, and form of lotion preparations made from basil leaf extract (*Ocimum basilicum*). The results of these observations can be seen in table 2.

Table 2. Organoleptic test results

Formula	Color	Smell	Form
F1	White	Typical	Soft and smooth
F2	Yellowish green	Typical	Soft and smooth
F3	Brownish green	Typical	Soft and smooth
F4	Dark green	Typical	Soft and smooth

Source: Primary data, 2024

pH Test

The pH test was conducted to determine whether the pH of the lotion preparation was in accordance with the skin pH standard, which is 4.5-6.5. The results of the pH measurement of the lotion containing basil leaf extract (Ocimum basilicum) can be seen in table 3.

Table 3. pH test results

Formula	Testing	Information
F1	6.59	Qualify
F2	6.30	Qualify
F3	6.45	Qualify
F4	6.32	Qualify

Source: Primary data, 2024

Homogeneity Test

Homogeneity testing aims to ensure that the lotion formula preparation is mixed evenly. The results of the homogeneity test of lotion with basil leaf extract (Ocimum basilicum) can be seen in Table 4.

Table 4. Results of homogeneity test

Formula	Homogeneity	Information
F1	Homogeneous	Qualify
F2	Homogeneous	Qualify
F3	Homogeneous	Qualify
F4	Homogeneous	Qualify

Source: Primary data, 2024

Spread Power Test

Spreadability testing was conducted to see the ability of the lotion to spread on the skin surface, with a good spreadability range between 7-16 cm. The results of the spreadability test can be seen in Table 5.

Table 5. Results of the spreadability test

Formula	Spread Power (cm)	Terms (cm)	Information
F1	4.1	7-16	Not eligible
F2	4.3	7-16	Not eligible
F3	4.2	7-16	Not eligible
F4	4.6	7-16	Not eligible

Source: Primary data, 2024

Discussion

This study was conducted to determine the formulation of lotion preparations from basil leaf extract (*Ocimum basilicum*) as a mosquito repellent. The results of the physical stability test of the lotion in table 2 are the results of the organoleptic test carried out to directly observe the shape, color and odor of the lotion preparation. The results of the organoleptic test of formula 1 showed a white color, distinctive odor, soft lotion form, smooth without coarse particles and easy to apply, formula 2 showed a yellowish green color, distinctive odor, soft lotion form, smooth without coarse particles and easy to apply, formula 3 showed a brownish green color, distinctive odor, soft lotion form, smooth without coarse particles and easy to apply, formula 4 showed a dark green color, had a distinctive odor, soft lotion form, smooth without coarse particles and easy to apply.

In Table 3, the pH test is carried out to determine the pH of the lotion that is suitable for the skin. This test must be to ensure safety of use, so that it can prevent irritation to the user's skin. The pH measurement was carried out using a pH meter (Sriwulan *et al.* , 2023) . The test results showed that the pH of the basil leaf extract lotion formula (*Ocimum basilicum*) was as follows: formula 1 has a pH of 6.59, formula 2 is 6.30, formula 3 with a pH of 6.45, and formula 4 is 6.32. All of these formulas comply with the SNI quality standard number 16-4399-1996, which states that the pH of lotion for the skin must be in the range of 4.5-8. If the pH of the lotion is too acidic, it can increase the risk of skin irritation.

In table 4, the homogeneity test was carried out to observe the presence or absence of solid materials or coarse particles on the object glass (Kadang *et al* ., 2019) . Based on the results of the homogeneity test, the basil leaf extract lotion preparation (*Ocimum basilicum*) in formulas 1, 2, 3 and 4 showed a homogeneous and good texture, without any coarse particles. This is in accordance with

the requirements for a good lotion, namely no coarse particles are visible. Thus, the lotion preparation made has met the specified requirements.

In Table 5, the spreadability test was conducted to evaluate the ability of the lotion to spread on the skin surface when applied. The test results showed that formula 1 had a spreadability of 4.1 cm, formula 2 was 4.3 cm, formula 3 was 4.2 cm, and formula 4 was 4.6 cm. The expected spreadability range for lotion is between 7-12 cm (Rantika *et al* ., 2020) . The spreadability results in this study did not meet the standards for good lotion spreadability. A quality lotion should have a wide spreadability, be easy to wash, and be well absorbed by the skin, thus increasing contact between the active ingredient and the skin (Agustin *et al* ., 2023).

Anti-mosquito test was conducted to determine the preparation of basil leaf extract lotion (*Ocimum basilicum*) as an anti-mosquito. The test results showed that formula 1 in this preparation did not have an extract so that in the lotion test many mosquitoes landed on the skin, formula 2 in this preparation had an extract of 1% so that in the lotion test there were still mosquitoes landing on the skin, formula 3 in this preparation had an extract of 3% so that in the lotion test mosquitoes landing on the skin were rare or few and formula 4 in this preparation had an extract of 5% so that in the lotion test no mosquitoes landed on the skin. Where the most effective test result as an anti is a lotion that is not landed by mosquitoes, namely formula 4 which has an extract of 5%. The test was conducted at night before going to bed for approximately 8 hours.

CONCLUSION

The results of the study showed that basil leaf extract (*Ocimum basilicum*) could be formulated as a lotion preparation that met the requirements in organoleptic tests, pH tests and homogeneity tests, but did not achieve good spreadability. Formula 4 with a concentration of 5% proved effective as an anti-mosquito and the results of the stability test also showed good performance in formula 4 with an active substance concentration of 5%. The limitation in this study was the relatively short time, so that the effectiveness test of the lotion as an anti-mosquito was not optimal .

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