

Production of Mosquito Repellent Body Lotion from the Species *Ocimum sanctum*

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Introduction

Mosquito-transmitted diseases such as Dengue Fever, Malaria, Yellow Fever and Arboviral Encephalitis are major concerns, all over the world. Every year, it is developing new strains of mosquitoes and infecting viruses are reported that lead to the failures in treatments. The number of dengue deaths reported for the first seven months of 2010 in Sri Lanka is about 165 and the number of dengue patients reported during the same period is about 34,000 (Ministry of Health, Sri Lanka). The main precaution for these infections is prevention of mosquito bites using repellent methods such as mosquito coils which is also reported to have side effects.

Mosquito repellent ability of natural plant substances was well known for hundreds of years. In Sri Lanka plants such as *Ocimum sanctum*, has been used from the ancient times. *O. sanctum* (holy basil) is one of the common plant species which is having the mosquito repellent ability (Shankar *et al.*, 2009). The active compound of this plant contains 7% eugenol, 4% caryophyllene - 3.8 mg, 1% triterpenic acids including ursolic acid, oleanolic acid, and rosmarinic acid (Prakash & Gupta, 2005). *O. sanctum* belongs to the family Labiatae characterized by square stem and specific aroma. Several medicinal properties have been attributed to the plant in ayurveda and unani systems of medicine. Juice of the leaves is used as demulcent, stimulant and expectorant (Shankar *et al.*, 2009). *O. sanctum* is a common weed in Sri Lanka which is highly available and a low cost value added product can be produced in commercial scale.

Aedes species and *Culex* species are two common mosquito species act as vectors respectively for dengue and filariasis. Current study is on production of a herbal based mosquito repellent body lotion which can be applied to human without any side effects to assure non toxicity and non irritancy.

Materials and methodology

Leaves of *Ocimum sanctum* were collected from Sirimalgoda area, Badulla. The eggs of the two mosquito species: *Aedes* and *Culex* were obtained from the Medical Research Institute (MRI) Colombo. Medically recommended cream base ingredients were obtained from Teaching Hospital Kurunegala.

Leaves of *O. sanctum* (1 kg) were cut into small pieces and the essential oil was extracted using steam distillation by heating the plant material at 120 °C in a liquid paraffin bath for 24 h. The extracted essential oil was stored at 4 °C until use in repellency testing.

A two cage apparatus (24 cm x 24 cm x 24 cm) along with a connecting corridor (60 cm) was constructed to determine the repellency of two mosquito species in the presence of different volumes: 25, 50, 100, 150 and 200 µl of extracted oil. Different amounts of the essential oil were introduced to a petri dish kept in the cage with mosquitoes and the percentage repellency was determined to assess the effective oil amount. 3-5 day old mosquitoes were used for the assays and commercially available citronella oil was used as the positive control. All the readings were taken in triplicates. Data were analyzed

parametrically using the one way ANOVA table under 90% confidence level, and pooled standard deviation values using Minitab Statistical Package version 14.0.

The base cream was developed in 2 steps by producing the emulsifying ointment (emulsifying wax 30%, white soft paraffin 50%, liquid paraffin 20%), and aqueous cream (emulsifying ointment 69%, water 30%, phenol 1%). The essential oil was mixed well with the base cream using a homogenizer to produce the body lotion. Product was tested for the suitability of applying on skin under medical supervision of the University Medical Officer, Uva Wellassa University with 15 volunteers. Questionnaires were given to the respondents to assess the acceptability of odor, texture, mosquito repellency, occurrence of allergic reactions and overall acceptability.

Results and discussion

Yellow colored essential oil (3 mL) was obtained from steam distillation of leaves of *Ocimum sanctum* (1 kg).

Tables 1 and 2 show the repellency percentages of the two mosquito species *Aedes* and *Culex*, respectively at different volumes of extracted oils. Parametrical data which were analyzed using the one way ANOVA table under 90% confidence level indicates that there is no significant difference on repellency parentage between the oil amounts for *Aedes* species ($P < 0.05$) but there is a significant difference for *Culex* species ($P > 0.05$). Further, when analyzing the pooled Standard deviation values for *Culex* species, there is a significant difference between the repellency at 100 μ l-150 μ l and 100 μ l- 200 μ l. But there is no significant difference between 150 μ l-200 μ l. Thus, according to the statistical analysis and considering the cost of production, efficiency of essential oil extraction and raw material availability, 150 μ l can be selected as the most effective essential oil amount, which has the maximum repellency for both species.

Table 1: Repellency percentage of *Aedes* species on different volumes of oil extract

Volume / μ L	Repellency percentage		
	Trial 01	Trial 02	Trial 03
25	60.00%	80.00%	60.00%
50	71.43%	85.71%	71.43%
100	83.33%	83.33%	83.33%

Table 2: Repellency percentage of *Culex* species on different volumes of oil extract

Volume/ μ L	Repellency percentage		
	Trial 01	Trial 02	Trial 03
100	20.00%	0.00%	20.00%
150	33.34%	33.34%	66.67%
200	66.67%	66.67%	33.34%

When considering the composition of prepared cream product, instructions should be given to apply about 1.5 mL to introduce a volume of 150 μ L of extracted oil to earn maximum repellency from *Aedes* and *Culex* mosquitoes.

Responses from the volunteer participants given through the questionnaire indicate 67% of the respondents like the odour of the product, 20% like it moderately and 13% dislike the odour of the lotion. 70% of the respondents stated that the mosquito repellency is excellent and 30% said it is moderate. No one stated that the repellency is poor. When considering the texture, 40% like the texture of the lotion, 47% like the texture moderately and 13% of the respondents do not like the texture of the lotion. No allergy reactions were reported. When considering the overall acceptability 53% of the respondents accepted the product as excellent and 47% said it is moderate. No one stated that the overall acceptability of the lotion is poor. Final assessment of the product acceptability gave an 86.67% result, saying that the product is acceptable.

Conclusion

This product is a low cost product which adds value to natural resources. This is also a good solution to the critical health issue of mosquito related diseases like "Dengue and Filaria.

References

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