

Evaluation on the Use of Repellent Soap in Vector Mosquito Dense Areas

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บทคัดย่อ

สบู่ทากันยุงเป็นผลิตภัณฑ์สารป้องกันยุงชนิดใหม่ มีส่วนผสมของ diethyl toluamide ร้อยละ 20 และ permethrin ร้อยละ 0.5 จำเป็นต้องมีการศึกษาเพื่อประเมินผลการใช้ในด้านประสิทธิภาพของสบู่ ทักษะคนติ และพฤติกรรมของประชาชนผู้ใช้ โดยการสัมภาษณ์และทดสอบในพื้นที่ยุงพาหะชุกชุม ผลการศึกษาพบว่าผู้ใช้ส่วนใหญ่ทาสบู่บริเวณแขน และขา มีน้อยมากที่ทาบริเวณลำตัว ใบหน้า และคอ โดยทาตอนเย็นหลังอาบน้ำและปล่อยให้แห้งโดยไม่ต้องล้างออก จากการสัมภาษณ์ ผู้ใช้ส่วนใหญ่มีความเห็นว่าสบู่ทากันยุงสามารถป้องกันยุงได้ดี ซึ่งตรงกับผลการทดสอบคือมีประสิทธิภาพในการป้องกันยุงในห้องปฏิบัติการเฉลี่ย 6 ชั่วโมง ในภาคสนามเฉลี่ย 5 ชั่วโมง 45 นาที ผู้ใช้เพียงร้อยละ 0.46 ที่มีอาการแพ้สำหรับปัจจัยอื่นที่เกี่ยวข้องกับการตัดสินใจใช้สบู่ทากันยุงได้แก่ ราคา กลิ่น เนื้อสบู่ รูปร่าง และฟอง ข้อมูลที่ได้เป็นประโยชน์ต่อการพิจารณาส่งเสริมให้มีการใช้สบู่ทากันยุงป้องกันโรคที่นำโดยแมลง

Abstract

The objective of this study is to evaluate the efficacy of the new type of insect repellent containing 20% diethyl toluamide and 0.5% permethrin, formulated as a soap and to study the attitude and behavior of the users. Results obtained from this study showed that most of the users had applied the soap on their arms and legs, while a few of them applied it on their body, face and neck. The time of application was mostly in late afternoon after bath. The majority of them (74%) commented that this soap was quite effective and only few of them developed allergy (0.46%). It gave a protection time of 6 hours in laboratory and 5.75 hours in the field. Besides the efficiency of the repellent soap, the users were concerned about its cost and other properties, e.g. odour, texture, shape and foamy characteristic. Data obtained will be helpful to consider the promotion of using the soap for self protection from mosquito-borne diseases.

Keywords

Repellent soap, mosquito, attitude

Introduction

Though there are many new synthetic substances and various methods for controlling insects, problems caused by mosquitoes still exist. Certain groups of people; for example night or early morning workers, border troops, forestry officers, vendors and farmers, especially those working in a rubber plantation are always bothered by this pest. The use of mosquito repellent is, therefore, a choice of protection against insect biting or transmitted diseases.^{1, 2}

A lot of chemicals are found to have repellent properties, i.e. when applied to the skin, they will stop some insects from probing or biting; however, only a few are safe and suitable for human population. Among these, diethyl toluamide, usually called as “Deet”, is the most well-known one, produced and marketed in various form, e.g. lotion, refreshing cloth, aerosol, etc. However, these products are not commonly used in Thailand since they are rather expensive. Because of this disadvantage, attempts have been made to reduce the production cost of repellents that are considerably effective against mosquitoes. Simmons (1985, personal communication) had mixed 20% deet with a synthetic pyrethroid called permethrin and produced mosquito repellent soap under MOSBAR trade name. Yap³ showed that the repellent soap could give personal protection against mosquitoes in the field for at least 4 hours. According to a study done in Samoa, Reed and Iosia* found that it gave personal protection for 6 hours.⁴ The objective of this study is to evaluate the efficacy of the repellent soap in both laboratory and field. It also aims at finding out the attitude as well as the behavior of users in high density of mosquito areas. Data obtained will be helpful to consider the promotion of using repellent soaps for self protection from mosquito-borne diseases.

Material and methods

Material

Repellent soap containing 0.5% permethrin (cis:trans ratio = 25:75) and 20% deet⁵ were provided by Tom Simmons from Simmons Nominees PTY LTD., Australia.

* Reed, D. and Iosia, T. 1985. Trial on the use of repellent soap on human baits: Western Samoa, October-November, 6 pp.

Methods

Study of attitude and behavior of the people using the repellent soap.

Interviews were conducted in 3 different experimental areas during May 1987-1988 where high density of malaria vectors, encephalitis vectors, and filariasis vectors were reported. Approximately 120 people were randomly selected from each area and free samples of repellent soap were given. One week later the follow-up interview was performed. Questionnaires covered two types of information: one on personal data of the subjects and the other on their attitude and behavior after using the soap. Data obtained during the interviews were evaluated by SAS software.

Study of the mosquito repellent soap efficacy.

● Efficacy test in laboratory

Three volunteers aged 20-30 years and 250 female mosquitoes of 4-5 days old *Aedes aegypti* which had been reared in laboratory and never took blood were used for testing in a temperature and humidity controlled room (27 ± 2 °C, 70-80% relative humidity). Approximately 0.1 g. of the repellent soap was applied on a 3 x 10 cm. area on the subject forearm. The area was moistened with water prior to the soap application. The forearm was introduced inside a previously prepared mosquito cage of 30x30x30 cm. and allowed to remain for 3 minutes, during which any mosquito bites would be noted. If no mosquito bite occurred within 3 minutes, the forearm was then taken out and the test was repeated every 30-minute interval. The experiment was completed after two mosquitoes had bitten. The time between the application of the soap and the time at which biting of the second mosquito occurred would be the protection time given by the repellent on each volunteer. The average protection time was then calculated from 3 replicated experiment.

● Field test

The experiment was conducted at an orchard in Bang Yai district of Nonthaburi province in May 1986. Shrubs and trees furnished abundant shelter for the mosquitoes. The average temperature in this area was 27 ± 3 °C with a relative humidity of 60-80%. Four subjects were equally divided into two groups, the first of which was applied with the soap thoroughly on the forearms and on the lower part of the legs, from knee to ankle. The second group which

served as a control did not have any application. The subjects from each group were allowed to sit three meters apart to prevent the odour of the soap exerting influence on the control group. There were 2 seating sites, an open area under the house and a place 5 meters away from the house. Each subject collected all mosquitoes landing on the exposed skin using small tubes for 20 minutes and rested for 20 minutes between each collection. The experiment was completed after the subjects were bitten by two mosquitoes in the test.

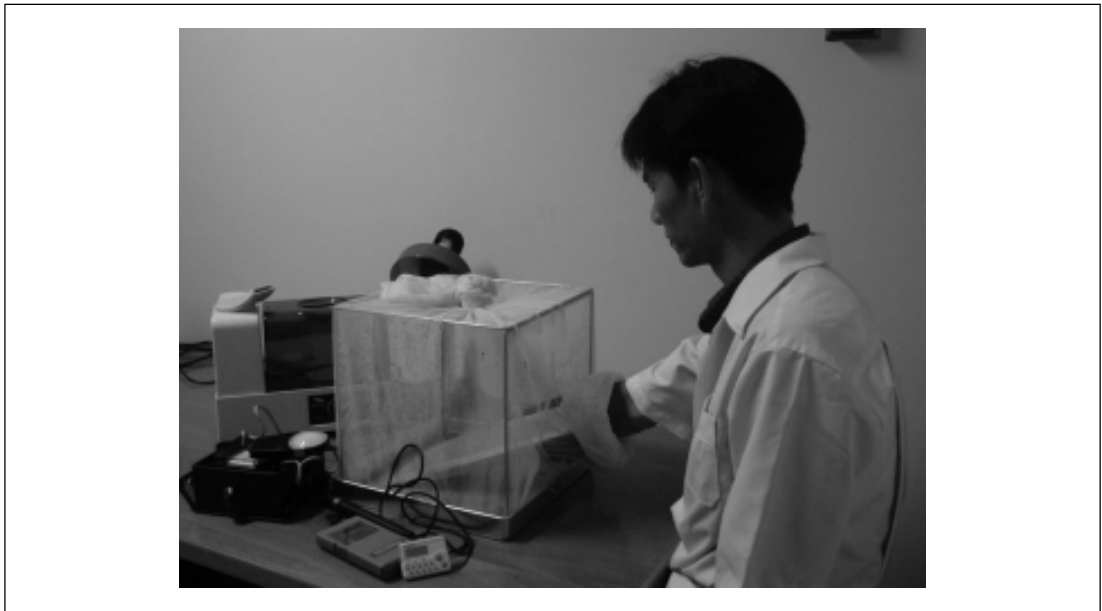


Figure 1 Efficacy test of the repellent soap in laboratory

Results

Attitude and behavior of the people using the repellent soap

Among 430 subjects interviewed 89.53% had never used any repellent before. Most of them (96.51%) applied the soap on their arms, while fewer users applied it on their legs, face, body or neck respectively. About 56% preferred using it from late afternoon to dusk. After application, 61.39% of them felt comfortable rather than sticky or warm at the site of application on their skin. The majority of the users (73.95%) said that it gave good protection against mosquitoes and 82.32% recommended its use in the high density of mosquito areas. However, 50.46% of the users suggested that the odour of this repellent soap should be improved (Table 1).

Table 1 The percentage of subjects, interviewed in different areas, classified according to attitudes towards the soap.

Attitude on application	% of interviewed subjects			
	Malaria area	Encephalitis area	Elephantiasis area	Total
Applied on arm	92.96	100.00	95.94	96.51
Applied at late afternoon	50.78	72.07	43.91	56.04
Felt comfortable	51.56	57.14	74.32	61.39
Good efficacy	75.78	64.93	81.75	73.95
Should be used in mosquito-dense area	75.78	92.55	78.37	82.32
Unpleasant odour	39.84	70.77	38.51	50.46
No. of subjects	128	148	154	430

The mosquito repellent efficacy

Laboratory test showed an average protection time of the soap against *Aedes aegypti* mosquitoes of about 6.0 ± 0.35 hours (range 5.5-6.5) after application.

Field test showed that the mean biting rate for the mosquitoes on the soap treated group was 6 mosquitoes/man-hr (range 0-6) as compared with 65.5 mosquitoes/man-hr (range 4.5-169.5) recorded on the untreated group. Percentage reduction of biting for the mosquitoes remained very high (range 90-100) observed upto 6.08 hr post treatment (Table 2).

The mosquito species collected in the area were identified as 44.8% of *Armigeres subalbatus*, 19.8% of *Culex gelidus*, 12.1% of *Mansonia* spp., 9.9% of *Culex quinquefasciatus* and 8.2% of *Anopheles* spp., 3.0% of *Aedes* spp., and 2.2% of other spp.

For the two soap-treated subjects (starting from 15:45 h), one was bitten at 5.42 hr and the other at 6.08 hr after treatment, giving an average protection time of 5.75 hr

Table 2 Number of collected mosquitoes at Bang Yai district, Nonthaburi province.

Treatment	Time post-treatment (Hour)				
	3.42	4.08	4.75	5.42	6.08
Treated group	0	0	0	2	4
Control group	3	113	48	20	42
% reduction	100	100	100	90	90.47

Discussion

The species composition of mosquitoes at the experimental sites provided all of common mosquito species in Thailand and the repellent soap gave a high degree of protection ranging from 90 to 100%. The results indicated that the soap are effective for *Armigeres*, *Culex*, *Mansonia*, *Anopheles* and *Aedes* for up to 5.75 hr in the field. The results from this study was similar to the finding of Yap³ in Malaysia and Reed & Iosia in Samoa⁴.

Moreover, it was found that the interviewed people had favourable attitude towards the soap because it gave good protection against mosquito biting. Futhermore, since majority of the subjects had never used any repellent before, they then accepted this repellent soap quite readily. However, some had suggested that its odour and texture should be improved. In addition, repellent soap suitable for tropical regions should possess other properties apart from its good protection, e.g. lack of stickiness.

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