

RESEARCH NOTE

EVALUATION OF NEEM OIL AS SANDFLY, *PHLEBOTOMUS PAPATASI* (SCOPOLI) REPELLENT IN AN ORIENTAL SORE ENDEMIC AREA IN RAJASTHAN

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Topical application of 2% neem oil mixed in mustard oil provides 86.1% protection for about 7 hours against the bite of *Phlebotomus papatasi* (Scopoli) under laboratory conditions (Sharma and Dhiman, 1993). One ml of 5% neem oil in acetone applied to cardboard mats when used on electric heating device marketed for use for synthetic pyrethroid mats, have been reported 100% effective as space repellent against anopheline mosquitos (Sharma *et al*, 1993). A study was therefore undertaken to evaluate the efficacy of neem oil preparations as repellent against *P. papatasi* field populations.

P. papatasi (Scopoli) is the vector of cutaneous leishmaniasis/oriental sore (WHO, 1984) and Phlebotomus fever virus (Goverdhan *et al*, 1976). Studies were carried out in endemic area of oriental sore in Rajasthan Canal Zone (Sharma *et al*, 1973) in July 1993. At Chaiyan village in Sri Ganganagar district of Rajasthan, four mud-plastered human dwellings measuring 3 m × 3 m, 3m × 4 m, 4 m × 4 m and 4.5 m × 4.5 m were selected for experiments. The density of *P. papatasi* ranged from 42 to 84 per man hour. Fourtests, viz 1) vaporising of 5% neem oil in acetone on mat (measuring 35 mm × 25 mm × 3 mm) soaked in 1 ml and heated on an electric heating device, 2) topical application of 2% neem oil, 3) mustard oil, and 4) a control (without any oil, etc), were carried out for 5 consecutive nights. The neem oil used in the study was marketed by Unjha Ayurvedic Pharmacy, Unjha, Gujarat. Our earlier field studies (unpublished) on *P. argentipes* showed that in cattle sheds neem mat vapors did not circulate properly owing to rough wall surface. In the present study, therefore, in the room with mat, an electric table fan facing the corner on the opposite side of the bait was used throughout night for ensuring circulation of vapors from the neem mat.

In one room with neem mat a volunteer was laid on a cot with exposed face, arms and legs. In second room one volunteer applied about 2-3 ml of 2% neem

oil (diluted in mustard oil) on exposed face, arms and legs. In third room a volunteer applied only mustard oil while in fourth room the volunteer without any application of oil or neem mat in the room, served as control. One insect collector was appointed for each room. The experiment was supervised in regard to uniformity in use of repellent and sandfly collection.

Room temperature and relative humidity during the nights were in the range of 30-34°C and 48-66%, respectively. Sandflies alighting on volunteers were collected throughout night (1900 to 0600 hours) with the help of torch and suction tube at 10 minute intervals and held in separate test tubes for counting and sexing. At 0600 hours the total catch of resting sandflies was made in all the rooms for 20 minutes by one collector each to see the space repellent effect of tests on resting sandflies. The rotation of baits, collectors, rooms and tests was done as per experimental design based on 4 way orthogonal Gaeco Latin Square except that in one room, owing to non-availability of electricity the test on mat could not be done.

Table 1 gives the results of repellent action of neem oil on *P. papatasi*. On volunteers with 5% neem mat not a single *P. papatasi* landed and the majority of sandflies were repelled out of the room. On volunteers with application of 2% neem oil, only two female sandflies landed, between 0500 to 0600 hours. There was 97.6% protection. On volunteers with mustard oil alone 7 female sandflies (and 2 males) landed in the night collections after 2400 hours onwards. There was 91.8% protection with mustard oil but only in the first half of the night, i.e. for 5 hours. In control without oil, sandfly activity started from 2100 hours and ceased at 0400 hours (Fig 1) and an average of 17.2 ± 2.58 female sandflies landed in 5 nights. The difference in the number of sandflies alighting on volunteers with 5% neem mat vs control, 5% neem mat vs mustard oil and 5% neem mat vs 2% neem oil was highly significant ($p < 0.001$). The differences between

Table 1

Evaluation of neem oil as repellent to *Phlebotomus papatasi* under field conditions.

Sandflies	Mean no. of female sandflies alighted/caught (5 night nights collection in a village in Rajasthan)			
	5% neem oil mat (in acetone and 1 ml used on a mat)	2% neem oil (in mustard oil)	Mustard oil alone	Control
Alighting sandflies	0.0 (0) p < 0.001	0.4 ± 0.27 (2) p < 0.001	1.4 ± 0.27 (7) p < 0.001	17.2 ± 2.58 (86)
Total resting sandflies caught in rooms	9.6 ± 2.79 (48) p < 0.01	25.6 ± 2.79 (128) p > 0.1	32.2 ± 5.72 (161) P > 0.1	33.0 ± 5.17 (165)

Dates of collection: 25.7.93 to 29.7.93

Figures are mean ± SE, p-values are given between concerned test vs control.

The figures in parentheses denote the number of sandflies alighted/caught.

2% neem oil vs mustard oil (p < 0.05) and 2% neem oil vs control (p < 0.001) was also highly significant.

Total catch of *P. papatasi* in rooms with mat and control was 48 and 165 respectively indicating highly significant (p < 0.01) repellent effect (space) of neem mat. The total catch of sandflies in rooms with mat and 2% neem oil was also significant (p < 0.01). The difference in total catch of resting sandflies on walls

between 2% neem oil vs control and mustard oil vs control was not significant (p > 0.1) indicating only contact repellent effect of 2% neem oil.

The overall results of this study indicate that application of 2% neem oil provided 97.6% protection for 10 hours. Keeping in view the biting activity of *P. papatasi* under field conditions, which commences from 2100 hours (Fig 1), if 2% neem oil is applied at 2100 hours it may provide 100% protection throughout the night. The use of neem mats also provided 100% protection from biting with the help of a table fan for air circulation. With anopheline mosquitos 100% protection has been reported by using 5% neem mat alone (Sharma *et al*, 1993). Unlike mosquitos, sandflies remain hidden in cracks, crevices and corners of walls; are poor fliers and move by hopping on wall surface. Therefore, a space repellent like mat alone may not be so effective against sandflies (since some sandflies are not affected) as with mosquitos. However, the efficacy could be increased by using an electric table fan which ensured proper circulation of mat vapors. Though all the sand flies could not be driven out by neem mat vapors, they hide and will not bite and provided 100% protection

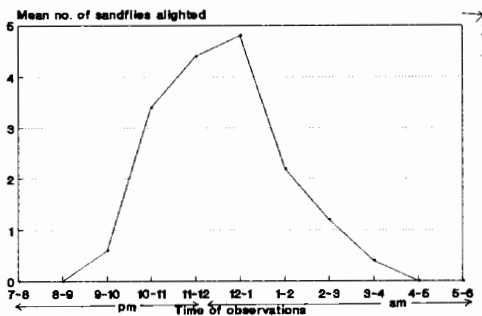


Fig 1—Night biting rhythm of *P. papatasi* in Chaiyan (Sri Ganya Nagar), Rajasthan,

from bites. Therefore, electric device neem mats are also equally good in preventing man-sandfly-contact.

Thus 2% neem oil and 5% neem mats are recommended as a cheap, easily available and preparable repellents against the bites of *P. papatasi* under field conditions.

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