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SHORT COMMUNICATION

Response of *Sitophilus* the common weevil of rice and other stored food products in Sri Lanka to essential oils in olfactometer tests.

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Extensive studies have been carried out to find out how insects react to various chemicals. The results obtained from such studies are useful in selecting chemicals which will either attract (attractants) or repel (repellents) insect pests. Insecticides are used widely in pest control, but they are less specific in their action and will kill both target and non-target insects. Insecticides are generally known to be toxic to animals and man. In contrast, repellents have a certain degree of selectivity. As it is important to select chemicals that are least harmful to man and domestic animals for the control of insect infestation in stored food, studies on repellents may be valuable for future development.

In Sri Lanka it has been a traditional practice in homes to introduce fresh leaves of lime—*Citrus aurantifolia* (Christm.) Swingle, to stored rice in order to preserve it from weevils. The present investigation was stimulated by this practice, and is concerned with the possible efficacy of lime leaf oil and other essential oils as repellents to the stored food product pest, *Sitophilus*, found in stocks of rice and flour. This short communication is an advance report of the work.

For this investigation, an olfactometer used by Howell and Goodhues for butterflies was modified as shown in Fig. 1. In each trial the test adult insects were given the choice of the two sides A and B of the olfactometer. A contained the repellent oil and water, and B contained water only. 15 insects were placed in the central cavity of the test-box, the details of which are shown in Fig. 2. At the end of 7 minutes, counts of the insects on the two compartments of the test-box indicate the reaction of the weevil to the test substance. At the end of each trial the apparatus was washed and dried. It was used again after a period of approximately 5 hours. Trials were carried out with increasing concentrations of the essential oil and ten replicates were done for each concentration.

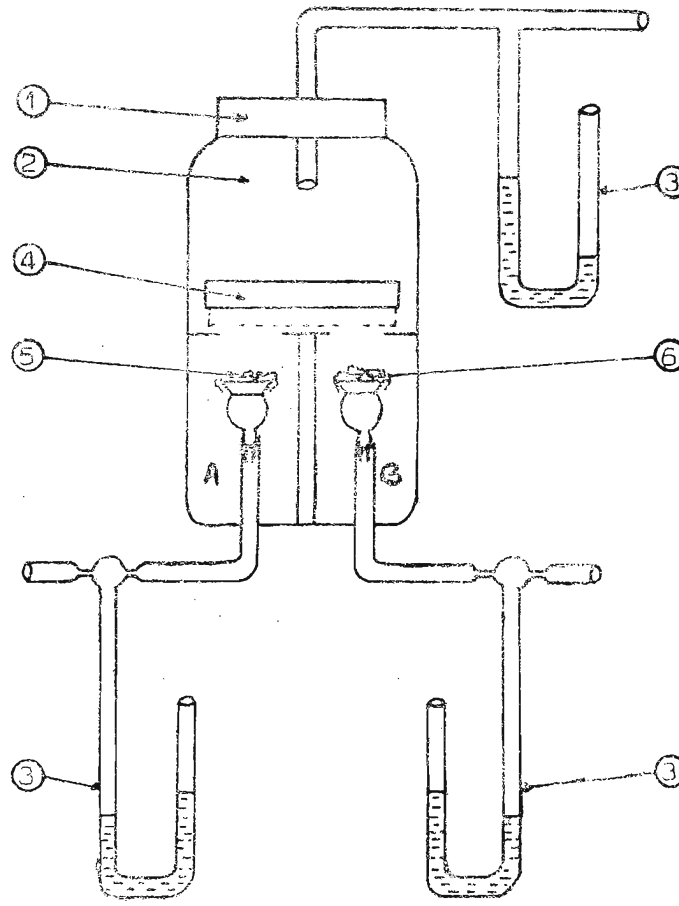

Fig. 1 Olfactometer

1. Wooden dise
2. Detecting chamber
3. Manometer
4. Lid of test-box
5. Gauze with essential oil and water
6. Gauzes with water only

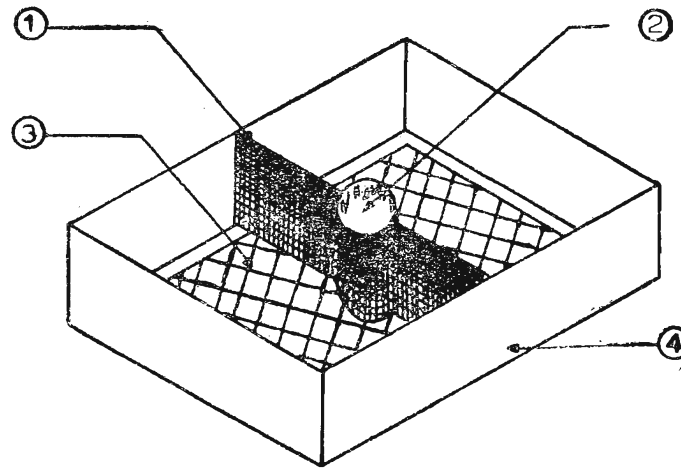

Fig. 2 Test box

1. Central partiton
2. Central cavity
3. Wire mesh
4. Side of metal test-box

TABLE 1. Response of *Sitophilus* to concentrations of citronella oil and lime leaf oil

Citronella oil			Lime leaf oil		
Conc. in ml.	% Repulsion	SD %	Conc. in ml.	% Repulsion	SD %
0.07	—41.53	19.18	0.01	+52.20	4.58
0.15	—24.70	6.32	0.02	+54.40	8.08
0.25	—22.50	8.78	0.03	+47.60	0.65
0.45	+1.67	30.00	0.07	+20.00	12.34
0.65	+12.40	7.20	0.10	+12.00	9.79
0.85	—2.00	20.00	0.25	+23.30	20.14
1.00	—1.11	19.70			
1.50	+8.35	18.90			
2.00	+15.30	15.30			
2.50	—9.30	25.68			

The raw data from the trials are given in Table 1. There is evidence that citronella oil attracts the weevil. In experiments with citronella oil it was found that at very low concentrations there was definite evidence of attraction. For example at 0.07 ml there was a percentage repulsion of —41.53 or a percentage attraction of +41.53. At 0.15 ml and 0.25 ml there was positive attraction. Above a concentration of 0.25 ml there was no definite pattern of attraction or repulsion. At higher concentrations, there were no points which showed significant repulsion (i.e. significance at 95% level).

In the case of lime leaf oil, positive repulsion was observed at all concentrations. Repulsion was more marked at low concentrations than at higher ones. Thus at 0.01 and 0.02 ml of lime leaf oil, 52.2 percent and 54.4 percent insects were repelled. The percentage repulsion decreased as the concentration increased.

Statistical analysis of results was done in order to test the suitability of the lime leaf oil as a repellent of stored food, and the following deductions were made. There appeared to be similarity in the extent of repulsion within the three low concentrations and also within the three higher concentrations. Accepting that there is overall repulsion, an analysis of variance was done to see if there is significantly greater repulsion at lower concentrations than at higher concentrations. The results showed that the difference in repellency between the three low concentrations and the three higher concentrations was highly significant, (F test at 0.1% level) and that there was no detectable difference within either the three low or the three higher concentrations. Extent of difference between the low and high concentrations was measured by the fact that out of 15 insects on an average 2.6 ± 1 more insects were repelled at lower concentrations than at higher concentrations.

During this study an attempt was made to find repellent constituents in oils selected. A full account of this study is under preparation and will be published shortly.

This study was carried out as an undergraduate research project under the supervision of Dr. N. N. de Silva at the C.W.E. Research Laboratory, Colombo.

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Reference

1. Howell D. E. & Goodhues L. D. (1965) *J. Econ. Ent.* **58**: 1027