SUITABILITY OF INSECTICIDES FOR USE IN RED PALM WEEVIL PHEROMONE TRAPS

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INTRODUCTION

THE RED PALM WEEVIL, (RPW) *Rhynchophorus ferrugineus* Oliv. is known to attack several palm species all over the world (Lever, 1969). Among the plantation crops attacked by RPW, coconut, *Cocos nucifera* L., date palm, *Phoenix dactylifera* L. and oil palm, *Elaeis guineensis* Jacq. are of economic importance (Faleiro *et al.* 1998).

RPW infested palms, if not detected and treated in the early stage of attack, often die due to feeding by the grubs. RPW has been managed by adopting an Integrated Pest Management (IPM) strategy comprising several components, including trapping of the adult weevils population with food attractants, (Abraham and Kurian, 1975; Kurian *et al.* 1979).

However, food traps are not very efficient and have to be the frequently replenished (Chinchilla and Oehlschlager, 1993). With the synthesis and availability of the male produced aggregation pheromone (4-methyl-5-nonanol) in mid-1990s by Hallett *et al.* 1993, trapping of RPW adults with food-baited pheromone traps has become a vital component of the IPM strategy adopted against this dreaded pest (Abraham *et al.* 1998).

Chemically synthesized pheromones increase the attractiveness of food baited traps several fold (Oehlschlager, 1994). RPW pheromone traps are used in (a) weevil surveillance programmes, (b) mass trap the pest and (c) assess the effectiveness of IPM programmes against RPW.

Besides the chemical lure, RPW pheromone traps contain a food bait and insecticide. While the food bait acts synergistically with the pheromone to increase the overall weevil attracting capacity of the trap (Hallett *et al.* 1993), the insecticide solution immobilizes and kills the attracted weevils that enter the trap thereby preventing the escape of trapped weevils (Oehlschlager *et al.* 1993).

The present study aims to evaluate commonly available insecticides, that can be used in the pheromone traps to immobilize and kill the trapped weevils without impairing the weevil attracting potential of the pheromone lure.

MATERIAL AND METHODS

A field trial was carried out at ICAR Research Complex for Goa, Old Goa for five weeks during September and October, 2001, wherein eight insecticides were evaluated for their use in food baited RPW pheromone (ferrolure +) traps. Besides these insecticidal treatments, a control without any insecticide was also maintained.

All insecticides were tested by using a four window (1.5 x 5 cm), five litre capacity high density polyethylene bucket trap as recommended by Abraham *et al.* 1998. Traps were hung under the canopy of coconut palms at 1 m above ground level. In each trap 250 g of tender coconut petiole was used as food bait, to which was added one litre water and the required quantity of insecticide to obtain the desired concentrations as mentioned below.

Sr. No.	Insecticide	Concentration
1	Carbofuran 3G	0.03%
2	Chlorpyriphos 20EC	0.05%

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3	Nimbicidine (Azadirachtin 0.03%EC, 90.57% neem oil)	0.5%
4	Monocrotophos 36SL	0.1%
5	Phorate 10G	0.03%
6	Carbaryl 50WP	0.1%
7	Endosulfan 35EC	0.1%
8	Deltamethrin 2.8EC	0.0028%
Control	No insecticide	–

Each treatment was replicated thrice. A distance of 25 m was maintained between two treatments, while replications were set 100 m apart. Due to the aggregating or clumped distribution pattern of RPW (Faleiro *et al.* 2002) and in order to nullify the spot effect, if any, the experimental traps were shifted from one spot to another so that each treatment was placed at a given spot for four days. Thus, each trap had an equal opportunity to attract RPW adults at a given spot.

All traps were serviced once a week, when the food bait and insecticidal solution was replaced and the number of weevils captured was noted. In the control treatment where there was no insecticide a count of the trapped weevils was taken every alternate day, so as to minimize the escape of live weevils which were then physically destroyed. Further, the data on weevil captures was compiled and subjected to the ANOVA test for weekly as well as cumulative weevil counts, to ascertain the significance of difference among treatments if any.

RESULTS AND DISCUSSION

From the Table it can be seen that there was significant difference among the treatments during the second and fourth week. Also, significant differences among weevil captures were observed when the data was pooled and analyzed on a cumulative basis. The highest weevil captures of 9.33 weevils per trap during the second week was recorded by traps containing carbofuran 3G.

However, in the fourth week monocrotophos recorded the best weevil captures of 4.33 weevils per trap and was at par with carbofuran, which registered a catch of 3.00 weevils. A look at the pooled data also shows that traps containing carbofuran 3G registered the best weevil captures of 25.00 weevils per trap.

Table

Mean weevil captures in red palm weevil pheromone traps with different insecticides (12/10/01 to 17/11/01)

Treat No.	Insecticides used	Average weekly weevil captures: Week 1	Week 2	Week 3	Week 4	Week 5	Cumulative
1.	Carbofuran 0.05%	4.33 (2.08)	9.33 (3.07)	6.66 (2.60)	3.00 (1.87)	1.66 (1.35)	25.00 (4.97)
2.	Chlorpyriphos 0.05%	1.66 (1.44)	1.66 (1.35)	1.00 (1.09)	1.00 (1.09)	0.66 (1.05)	9.00 (2.53)
3.	Nimbecidine 0.5%	2.00 (1.42)	4.00 (1.93)	0.00 (0.71)	0.66 (1.05)	1.66 (1.35)	7.00 (2.52)
4.	Monocrotophos 0.1%	0.66 (1.05)	1.66 (1.44)	2.66 (1.74)	4.33 (2.18)	1.33 (1.29)	10.6 (3.27)
5.	Phorate 0.03%	1.00 (1.17)	2.00 (1.48)	2.66 (1.74)	0.33 (0.88)	1.33 (1.34)	7.33 (2.77)
6.	Carbaryl 0.1%	0.66 (1.00)	3.66 (1.83)	5.66 (2.29)	1.33 (1.26)	[illegible] (1.49)	[illegible] (3.37)
7.	Endosulfan 0.1%	2.00 (1.42)	1.66 (1.46)	1.00 (1.17)	2.00 (1.47)	2.66 (1.55)	9.33 (3.07)
8.	Deltamethrin 0.0028%	2.66 (1.61)	1.33 (1.34)	4.00 (2.08)	1.33 (1.34)	3.33 (1.79)	12.6 (3.62)
9.	Control	1.66 (1.44)	0.33 (0.88)	1.00 (1.17)	3.33 (1.95)	1.00 (1.09)	7.33 (2.77)
CD	P = (0.05)	NS	0.68	NS	0.31	NS	1.17

Figures in parentheses denote converted values, using $\sqrt{X+0.5}$ transformation, where X is the average weekly weevils trapped.

Abraham and Nair, 2001 also recorded the highest weevil captures with carbofuran in a trial to evaluate insecticides for use in RPW pheromone traps. Oehlchlager *et al.* 1993 used carbofuran to treat palm stem pieces baited with rhynchophorol to develop a pheromone based trapping system for *Rhynchophorus palmarum* in Costa Rica. In the present study pooled analysis of weevil captures also revealed that traps containing deltamethrin and carbaryl were at par and stood second and third, respectively but were significantly different from carbofuran. The Table further reveals that the lowest weevil captures of 7.00 weevils per trap was recorded by nimbicidine probably due to the offensive odour associated with this insecticide. Cumulative analysis also showed that in control traps where there was no insecticide, weevil captures were low and at par with traps containing insecticides having an offensive odour *viz.* Nimbecidine, chlorpyriphos and phorate. The low catch in traps having no insecticide can be attributed to the escape of weevils after entering such traps emphasizing the need to add insecticides in traps to retain the captured weevils as suggested by Hallett *et al.* 1999. Similar results have been reported by Abraham and Nair, 2001.

From the results presented and discussed above, carbofuran 3G is the most suitable for use in red palm weevil pheromone traps.

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