EVALUATION OF FIVE INSECTICIDES FOR USE IN THE RED PALM WEEVIL PHEROMONE TRAPS

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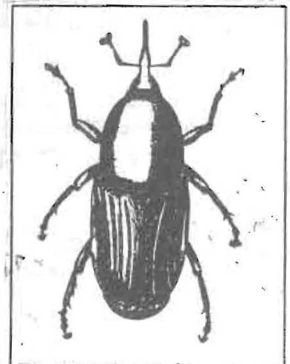
ABSTRACT

Red palm weevil, *Rhynchophorus ferrugineus* Oliv. (Coleoptera: Curculionidae) is a dreaded pest of coconut palm in India. The pest is suppressed by employing an Integrated Pest Management package. Food baited pheromone trapping is one of the most effective tools used in this IPM schedule. Insecticides are mixed with the food for *in situ* killing of the trapped weevils.

In a comparative field study on the efficacy of five insecticides, it was found that carbofuran and carbaryl treatments had highest catch of the weevils. However, the control i.e., traps without insecticides also had a high catch of weevils. In traps without insecticides 28 percent of the weevils caught were alive even on the 7th day till the food was changed. In order to prevent the escape of weevils, addition of insecticide in the trap, therefore, is essential.



Rhynchophorus ferrugineus

KEY WORDS: Red palm weevil, coconut, pheromone trap, insecticide.

INTRODUCTION

Red palm weevil, *Rhynchophorus ferruginenus* Oliv. is an all-time arch enemy of coconut palm in India. This pest has become a major threat to coconut cultivation, especially in the root (wilt) tracts. The female weevil lays eggs in the wounds of coconut palms and the grubs hatching out of the eggs bore into the inner tissues of the palm. They feed inside the palm trunk without any external symptoms visible at a glance. The farmer realises about the infestation only when the palm topples. However, periodical and systematic monitoring of palms for symptoms of pest infestation helps in the detection of red palm weevil infestation in time.

This pest is brought under control by employing an Integrated Pest Management schedule developed for the purpose (Abraham *et al.* 1989). Among the various pest control techniques incorporated in the IPM, trapping of red weevil using pheromone traps is the most effective one. Trapping the weevils using synthetic pheromone lures is a widely practised method. Pheromone sachet is placed in a 5 - 7 litre capacity plastic bucket with the appropriate food material fermented with yeast and mixed with an insecticide for effecting the *in situ* killing of the trapped weevils. Different insecticides are used for this purpose. Abraham (1987) recommended 2 g of HCH 50 percent for use in coconut log traps.

Since there is no scientific data available for the selection of the best insecticide, an experiment was conducted in a farmer's garden at Karunagappally, Kerala, for this purpose. Results of the above studies are reported here.

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Table

Mean weevil capture in red palm weevil traps with different insecticides and pheromone lure

Treat. No.	Insecticide	Week 1	Week 2	Week 3	Mean
T_1	Carbaryl	3.20 (10.25)	2.89 (8.00)	2.68 (6.75)	2.93[ab] (8.33)
T_2	Endosulfan	2.22 (4.75)	2.34 (5.25)	2.47 (5.75)	2.34[cd] (5.25)
T_3	Chlorpyriphos	1.86 (3.00)	2.28 (4.75)	2.15 (4.50)	2.09[d] (4.08)
T_4	Carbofuran	3.36 (11.00)	3.67 (13.00)	2.73 (7.00)	3.25[a] (10.33)
T_5	Phorate	2.96 (8.50)	2.71 (7.00)	2.25 (6.25)	2.74[bc] (7.25)
T_6	Control	3.09 (9.25)	2.82 (7.00)	3.04 (9.00)	2.98[ab] (8.58)

(Figures in parantheses denote original mean values). In a column, means superscribed by a common letter are not significantly different. C.D. for treatment - 2.247.

MATERIAL AND METHODS

Five litre capacity plastic buckets with lid were used as traps. Four equidistant windows of 1.5 x 2.5 cm were made just below the upper rim of the bucket. Jute cloth was stuck to the outerside of the bucket to provide better grip for the attracted weevils to get into the trap. Pheromone lure was hung on the innerside of the lid using a metal wire (Abraham *et al.* 1998). From an earlier experiment, macerated plantain was found to be most efficient food bait for use in the pheromone trap for red weevil (Saritha *et al.*). In all traps, 200 g plantain (var. palayankodan) fermented with 2 g yeast and mixed in 1 litre was used as food bait. Different insecticides were used in traps to find out their efficiency. Details of the treatments are given below.

T_1	Carbaryl 50 WP
T_2	Endosulfan 30 EC
T_3	Chlorpyriphos 20 EC
T_4	Carbofuran 3 G
T_5	Phorate 10 G
T_6	Control. No insecticide (food + yeast.)

There were five replications. 25 m distance was maintained between treatments and 250 m between replications. Experiment was conducted for a period of 3 weeks. Food baits were changed every seventh day to be replaced with fresh ones. The number of weevils caught were recorded simultaneously. The data thus obtained were statistically analysed (after $\sqrt{x+0.5}$ transformation).

RESULTS AND DISCUSSION

Results are given in the Table. It can be seen that among the treatments, in T_4, i.e. carbofuran a mean of 3.25 weevils were caught. T_6, the control, having no insecticide stood in second position by registering 2.98 weevils followed by T_1 - carbaryl with a mean capture of 2.93 weevils. These three treatments did not differ significantly. T_5 - phorate caught 2.74 weevils which was statistically on par with T_1 and T_6. Endosulfan i.e. T_2 caught 2.34 and chlorpyriphos - T_3 caught 2.09 weevils. These two treatments are on par and are inferior to others.

It is interesting to note that the highest weevil capture was in traps with carbofuran followed by traps without insecticide. Since the capture of weevils in traps with carbofuran, carbaryl and no insecticide were statistically on par, it can be inferred that addition of insecticides in pheromone traps is not necessary for effective trapping of weevils. However, in a preliminary study under laboratory conditions, weevils were found dead in traps with plantain as food mixed with insecticides and alive upto 3 days in the traps without insecticide (Saritha and Abraham - unpublished data).

In the control traps (without insecticide) of the field trial also 28 percent of the weevils were alive at the time of food change i.e., on the 7th day. These weevils might have been trapped in the last two or three days just before the food change.

From these two observations, it is evident, that in the absence of an insecticide in the traps, weevils that are trapped in the last few days will remain alive and would get thrown out at the time of food change. Hence in order to ensure that no weevil escapes from the traps, addition of an appropriate insecticide is necessary.

Traps containing phorate/endosulfan/ chlorpyriphos captured comparatively less number of weevils. Carbofuran and carbaryl are insecticides with very mild smell whereas the other three have strong insecticidal odour. This odour might have repelled the weevils which were attracted towards the traps and hence the poor capture.

Oehlschlager *et al.* (1993) has reported that traps containing insecticide-free sugarcane caught significantly less weevils than traps with insecticide treated sugarcane. This shows that weevils trapped might have escaped from the traps having insecticide. Sugarcane bits (pieces) form a floating surface where trapped weevils can take shelter and then escape. But in the case of macerated plantain it forms a slurry and weevils that are trapped get entangled and a few of them remain alive. This is why there is no reduction in the number of weevils in control traps with plantain not treated with insecticides.

It can be concluded that the use of insecticides in pheromone traps is essential to ensure the mortality of the trapped weevils, and insecticides *viz.* carbofuran or carbaryl are most suitable for mixing with the food bait in the red weevil traps.

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Pesticides to target insect life cycle

A new generation of chemical pesticides will disrupt the life cycle of insects, preventing them from reaching their normal adult form. Because the pesticides attach insect juvenile hormone, which has no equivalent in higher animals, they will be harmless to vertebrate animals and humans, says a new release from CSIRO Australia which is its largest public research institution.

The research team of scientists from CSIRO and the US has cloned two proteins which regulate the level of insect juvenile hormone. "The level of this hormone is crucial in development where it controls the process of metamorphosis," says Dr. Tony Zera of the University of Nebraska. "In insects such as locusts juvenile hormone is also one of the factors that controls the switch between their sedentary stage and their migratory stage. In the flight stage of their life cycle they are a moving target and much harder to control. Two key proteins called juvenile hormone esterase (JHE) and juvenile hormone binding protein (JHBP) control the level of juvenile hormone. This in turn regulates the passage of juvenile insects through their various moults to become adults.

"In many insects which have different adult forms specialised for different functions, the hormone also determines which of these adult forms they become," says Dr. Zera. "Alterations to JHE and JHBP disrupt development and in the case of insects like crickets and grasshoppers can prevent commencement of the migratory phase."

"The important step from the point of view of commercial application has been the cloning of JHE and JHBP in CSIRO Entomology's biotechnology program," says Dr. Zera. "This means that we can now apply for patents for the use of these genes in the search for new, safer chemical insecticides.