



Evaluation of Pheromones in the Management of Red Palm Weevil on Coconut

Introduction

Red weevil *Rhynchophorus ferrugineus* is a very notorious pest of coconut palms. Though it can attack palms of all ages, it prefers young palms, mostly those in the age group of 5-20 years. The female weevil lay eggs in the wounds of young palms. The grubs on hatching feed on the surrounding plant tissues often leading to the formation of tunnels. All stages of the pest are completed inside the palm trunk. The infestation is not detected very readily till the palm succumbs to the attack. Hidden nature of this pest makes the early detection of infestation and taking up timely curative control measures very difficult.

An integrated pest management programme (IPM) was first developed on coconut for the control of this pest (Abraham *et al* 1989) in which trapping the weevil using coconut log trap was included as a major component. Pheromones are chemicals exuded by the insects. These are chemical signals that aid specific functions like attracting the mates, for the aggregation of fellow insects etc. Abraham, 1987 first revealed the presence of pheromones in male *R. ferrugineus*. Later, Hallet. *et al* (1993) isolated a pheromone from male red weevils. This has two components viz., Ferruginol (4 - Methyl - 5 nonanol) and Ferrugenon (4 - Methyl - 5 nonanon). 'Chem Tikka - International' a Costarican company manufactures and markets this and sells it in the name of Ferrolure. A U.K. based firm 'Agrisens B.S.E. Ltd.' also produces two formulations of this pheromone. CPCRI has also acquired the know how for the mass production of this pheromone. The bucket trap for setting the pheromone in the field was designed by Oehlschlager *et al* (1993). This trap was suitably modified to enhance weevil capture. Abraham *et al.* (1999) reported that effective weevil trapping is possible only if pheromone lure is used along with the food bait. Muthiah *et al*, 2003 evaluated certain food baits used in pheromone trap of red palm weevil. By collecting insects using these lures, one can get an idea about the population of red weevils in a given locality. Similarly, this also helps to collect the floating population of insects from a locality. In the present study also certain selected food baits evaluated along with the pheromone. Also the efficacy of a pheromone synthesized from Central Plantation Crops Research Institute, Kayankulam is compared with the commercial pheromone.

Materials and Methods

Pheromone traps form a very important component in the IPM practices for red palm weevil. Pheromone traps were made as described by Abraham *et al* (1998) using ten litre capacity plastic buckets with lids. Four windows (1.5 cm x 5 cm) were made equidistantly at the top of the bucket just below the upper rim. To provide better grip for the attracted weevils, jute cloth was stuck on the outer side of the bucket. This enables the attracted weevils to get into the bucket. The pheromone lure was hung on the inner side of the lid using a metal wire. Different food bait materials as attractants such as Pineapple juice,

coconut toddy, rice gruel, palmyrah fruit pulp and tender coconut water were used as the test materials.

In all 24 bucket traps were used in 4 replications (6 traps in each replication). A distance of 25 m was maintained between treatments and 250 m between replications. Each bucket contained the different food materials + 5 gm yeast + 5ml glacial acetic acid + carbaryl 2 gm in sufficient water to form one litre. Yeast, glacial acetic acid and carbaryl were added to the food material for fast fermentation and to kill the trapped weevils respectively.

The first field experiment was conducted during January 2002 for 27 weeks at Coconut Research Station, Veppankulam to evaluate the effectiveness of certain food baits with pheromones. Another field experiment was also conducted during July 2002 for 18 weeks to compare the efficacy of pheromone synthesized by CPCRI, Kayankulam with the commercial pheromone.

Observations were taken once in a week and at the same time the traps were cleaned by washing and replacing the old food bait with fresh ones at 15 days interval. The number of weevils trapped every week were recorded and the data obtained were statistically analyzed using analysis of variance technique after the $\sqrt{X} \times 0.5$ transformation of the original values.

Results and Discussion

The result on the field experiment conducted during January 2002 (Table 1) showed that the treatment involving pheromone in combination with different food baits as attractants captured significantly more number of weevils than pheromone alone. Among the different treatments pheromone in combination with sugarcane molasses attracted significantly more number of weevils (14.12 weevil / week) followed by pheromone in combination with tender coconut water (7.58 weevils /



Table 1. Effect of pheromone + attractants of red palm weevil

Treatment	Mean number of weevils attracted on						Grand Mean
	5th week	10th week	15th week	20th week	25th week	27th week	
Pheromone + Molasses	20.6 (4.59)	14.6 (3.88)	18.6 ^a (4.37)	11.4 (3.44)	11.0 (3.39)	8.5 (3.00)	14.12 ^a (3.78)
Pheromone + Tender coconut water	9.8 (3.21)	8.2 (2.94)	7.2 (2.77)	7.0 (2.73)	6.8 (2.70)	6.5 (2.64)	7.58 ^b (2.83)
Pheromone + Rice gruel	8.2 (2.95)	6.0 (2.55)	4.6 (2.26)	3.6 (2.02)	3.6 (2.02)	3.5 (2.00)	4.92 ^c (2.30)
Pheromone + Pineapple fruit juice	6.2 (2.59)	4.8 (2.30)	4.8 (2.30)	3.2 (1.92)	3.6 (2.02)	4.0 (2.12)	4.93 ^c (2.21)
Pheromone alone	5.6 (2.46)	4.2 (2.16)	3.2 (1.92)	3.4 (1.97)	3.0 (1.87)	3.5 (2.00)	3.81 ^c (2.06)
Control	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 (0.71)	0.0 ^d (0.71)
SE							1.01
CD							2.10

(Figures in parentheses denote transformed values) In a column, means superscribed by a common letter are not significantly different

week). Where as in control traps without any attractant captured less number of weevils (3.81 weevils / week). The present result confirm the findings of Muthiah *et al.* (2003) reported in red palm weevil pheromone traps. Highest weevil capture can be obtained by using palmyrah fruit juice and tender

coconut water as food bait than the pheromone traps used without food bait. By collecting insects using these lures one can get an idea about the population of red palm weevil floating around in a given locality. Similarly this also helps to collect the floating population of insects from a locality. In the present study the effect of

pheromone lure was observed even for 27 weeks. The results confirm the findings of Falerio *et al* (1998) who reported the field life of about five months for ferrolure in coastal belts of South Western India.

Another study conducted to compare the efficacy of pheromone synthesized at CPCRI, Kayankulam with that of commercial pheromone revealed that the new pheromone was equally effective as that of commercial pheromone in the attraction of red palm weevil. The pheromone synthesized from CPCRI, Kayankulam in combination with banana fruit juice attracted more number of weevils (12.71 / weevils / week) followed by palmyrah fruit juice and tender coconut water (Table 2). The present results, confirmed the findings of Saritha Nair *et al.* (2000), reported that weevil capture was highest in ripe plantain or sugarcane used as food bait.

It can be concluded from the above study that in red palm weevil pheromone traps, highest weevil captured can be obtained by using banana fruit juice, palmyrah fruit juice, sugarcane molasses and tender coconut water as food baits. The pheromone synthesized from CPCRI, Kayankulam is equally effective as that of the commercial pheromone and hence it can be made available locally for the farmers with less cost. Eventhough pheromone trapping of insects is a very useful and effective method for insect control. This alone can not singly bring about the desired measure of pest control. The various IPM measures should be integrated including pheromone trapping to bring about reduction of red palm weevil damage.

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Table 1. Comparison of pheromones in combination with attractants of red palm weevil

Treatment	Mean number of weevils attracted on				Grand
	5th wek	10th week	15th week	18th week	
Pheromone* + Molasses	6.93 (2.73)	9.19 (3.11)	11.19 (3.42)	7.66 (2.86)	8.74 ^a (3.03)
Pheromone** + Molasses	11.06 (3.40)	4.33 (2.19)	7.75 (2.87)	4.66 (2.27)	6.95 ^b (2.68)
Pheromone** + Palmyrah fruit pulp	6.47 (2.64)	7.86 (2.89)	17.26 (4.21)	3.89 (2.09)	8.87 ^a (2.96)
Pheromone** + Banana fruit juice	13.99 (3.80)	15.40 (3.98)	10.12 (3.25)	11.31 (3.44)	12.71 ^a (3.62)
Pheromone** + Tendernut water	5.93 (2.53)	11.73 (3.50)	10.60 (3.33)	9.31 (3.13)	9.39 ^a (3.12)
Pheromone** + Cashew fruit juice	4.99 (2.34)	5.33 (2.91)	7.46 (2.82)	3.43 (1.98)	5.30 ^b (2.51)
SE					2.13
CD					4.55

* Commercial pheromone ** CPCRI pheromone

(Figures in parentheses denote transformed values) In a column, means supscribed by a common letter are not significantly different



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