Proceedings of Placrosym XV (2002): 509-512

EVALUATION OF FOOD BAITS FOR USE IN THE RED PALM WEEVIL PHEROMONE TRAPS

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ABSTRACT

The red palm weevil *Rhynchophorus ferrugineus* F. is a destructive pest in young palms of coconut, oilpalm, and date palm. Trapping of adult weevil population with food baited aggregation pheromone traps is becoming an important eco-friendly component of the integrated pest management programme. Field evaluation was conducted on pheromone trap in combination with different natural plant products as food baits. The study conducted during 2000 revealed that pheromone + palmyrah fruit juice captured significantly more number (10.91 weevils/week) of weevils and it was on par with pheromone + tender coconut water (9.09 weevils/week). Where as control traps, without any food attractant, captured less number of weevils (2.85 weevils/week). In the year 2001 also the treatment with pheromone + palmyrah fruit juice captured significantly more (15.80 weevils/week) weevils followed by pheromone + tender coconut water (13.44 weevils/week). The treatment involving pheromone alone captured only a minimum number of weevils (4.52 weevils/week). Female weevils are attracted more for the pheromone trap than males. The effect of pheromone lure was observed even for 20 weeks.

INTRODUCTION

The red palm weevil *Rhynchophorus ferrugineus* F. is a dreadful pest that attack coconut palm in India and many countries in South and South East Asia. Besides coconut it also causes irreparable damage to date palm, oil palm and palmyrah. In both coconut and date palm, the females of red palm weevil lay eggs in the wounds on young palms, mostly preferring those in the age group of 5 to 20 years. The grubs on hatching feed on the surrounding plant tissue often leading to the formation of tunnels. The grubs bore in to the tissues, feed internally and ultimately kills the palm. All stages of the pest are completed inside the palm trunk. 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. Abraham (1987) first revealed the presence of Pheromones in male *R.ferrugineus*. Later, Hallet. *et al.*, (1993) isolated male aggregation pheromone ferrolure, a blend of ferrugineol and ferrugineone from male *R.ferrugineus*. 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.*, (1989) incorporated pheromone trapping as an effective contrivance in the IPM of red palm weevil. Abraham *et al.*, (1999) reported that when pheromone traps are used for trapping weevils, the effective weevil, trapping is possible only it pheromone lure is used along with the food bait. Different food bait materials were used in pheromone trap in India but a comparative study has not been conducted to find out the most effective food bait which will attract more weevils to the trap. Hence in the present study, different food baits were evaluated for its efficacy along with pheromone in attracting more number of weevils.

MATERIALS AND METHODS

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 outerside of the bucket. This enables the attracted weevils to get into the bucket. The pheromone lure (Ferrolure +) was hung on the inner side of the lid using a metal wire. Different food bait materials as attractants such as Pine apple juice, coconut toddy, rice gruel, palmyrah fruit pulp and tender coconut water were used as the test materials.

In all, 28 bucket traps were used in 4 replications (7 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 + 5 ml glacial acetic acid + carbaryl 2 gm in sufficient water to form one litre (Table 1). Yeast, glacial acetic acid and carbaryl were added to the food material for fast fermentation and to kill the trapped weevils respectively.

The field experiments were conducted during 2000 for 20 weeks at Coconut Research Station, Veppankulam. Observations were taken once 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 was recorded and the data obtained were statistically analysed using analysis of variance technique after the X+0.5 transformation of the original values.

RESULTS AND DISCUSSION

The results on the field experiment conducted during 2000 (Table 2) showed that the treatments involving pheromone in combination with different food baits as attractants captured significantly more number of weevils than pheromone alone. Among the different treatments, pheromone + palmyrah fruit juice captured significantly more number (10.91 weevils/week) of weevils and it was on par with pheromone + tender coconut water (9.09 weevils/week). Where as control traps without any food attractant captured less number of weevils (2.85 weevils/ week). In the second year of study also (Table 3) similar trend was observed. The treatment with pheromone + palmyrah fruit juice captured significantly more (15.80 weevils/week) weevils followed by pheromone + tender coconut water (13.44 weevils/week). The treatment involving pheromone alone captured only a minimum number of weevils (4.52 weevils/week). The present results confirm the findings of Kurian *et al.*, (1984) who reported that Pineapple was superior in weevil catch to grapes and inferior to coconut toddy when applied in coconut log traps. Saritha Nair *et al.*, (2000) reported that the weevil capture was highest in ripe plantain or sugarcane used as food bait. However, in the present study, pheromone traps with sugarcane juice or pineapple juice captured less number of weevils than the pheromone traps with coconut toddy. The effect of pheromone lure was observed even for 20 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.

It can be concluded from the above study that in red palm weevil pheromone traps, highest weevil capture can be obtained by using palmyrah fruit juice and tender coconut water as food bait. The lowest number of weevil capture in control trap in which no food bait was placed showed that for effective trapping food bait is essential. The pheromone lures attract weevils from distance towards the pheromone trap while the food volatiles orient the attracted weevils to enter into it.

Table 1. Treatment details and different food baits used

S. No.	Treatment material	Quantity used	Supplementary materials used
1.	Sugarcane pieces crushed	200gm	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
2.	Pineapple – crushed	200 gm	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
3.	Coconut toddy	200 ml	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
4.	Palmyrah fruit pulp	300 g	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
5.	Rice gruel	1 lit.	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
6.	Tender coconut water	1 lit.	Yeast 5 gm + glacial acetic acid 5 ml + carbaryl 2 gm
7.	Control – water alone	1 lit	Carbaryl 2 gm

Table 2: Effect of pheromone in combination with attractants in the attraction of red palm weevil, 2000.

S. No	Treatment	Mean number of weevils attracted on				Grand Mean
		5th week	10th week	15th week	20th week	
1	Pheromone + Sugarcane pieces crushed	5.59 (2.46)	6.06 (2.56)	2.19 (1.64)	0.93 (1.19)	3.69^{c} (1.54)
2	Pheromone + Pineapple – crushed	6.07 (2.56)	4.0-6 (2.13)	1.79 (1.51)	0.39 (0.94)	3.07^{c} (1.42)
3	Pheromone + Coconut toddy	13.19 (3.7)	10.66 (3.34)	4.19 (2.16)	1.13 (1.27)	7.29^{b} (1.98)
4	Pheromone + Palmyrah fruit pulp	16.99 (4.18)	14.26 (3.84)	9.53 (3.16)	2.86 (1.83)	10.91^{a} (2.40)
5	Pheromone + Rice gruel	7.79 (2.87)	2.66 (1.77)	0.79 (1.13)	0.33 (.91)	2.89^{d} (1.35)
6	Pheromone + Tender coconut water	14.39 (3.85)	12.86 (3.65)	6.99 (2.73)	2.13 (1.62)	9.09^{a} (2.21)
7	Pheromone alone(Control)	5.39 (2.42)	3.26 (1.93)	1.59 (1.44)	1.19 (1.3)	2.85^{d} (1.42)
	SE					0.46
	CD					0.98

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

Table 3: Effect of pheromone in combination with attractants in the attraction of red palm weevil, 2001.

S. No.	Treatment	Mean number of weevils attracted on				Grand Mean/ week
		5th week	10th week	15th week	20th week	
1	Pheromone + Coconut leaf petiole	7.79 (2.87)	6.79 (2.70)	6.13 (2.57)	0.79 (1.13)	5.37^{f} (1.78)
2	Pheromone + Pineapple – crushed	9.19 (3.11)	9.53 (3.16)	7.39 (2.80)	1.19 (1.3)	6.82^{e} (1.97)
3	Pheromone + Coconut toddy	14.15 (3.82)	13.46 (3.73)	10.59 (3.33)	6.53 (2.65)	11.18^{c} (2.49)
4	Pheromone + Palmyrah fruit pulp	18.59 (4.01)	17.39 (4.22)	20.86 (4.62)	9.39 (3.14)	15.80^{a} (2.90)
5	Pheromone + Rice gruel	8.13 (2.93)	8.99 (3.08)	8.93 (3.07)	6.33 (2.61)	8.09^{d} (2.18)
6	Pheromone + Tender coconut water	12.39 (3.59)	13.79 (3.78)	17.33 (4.22)	10.26 (3.28)	13.44^{b} (2.71)
7	Pheromone alone(Control)	7.19 (2.77)	4.13 (2.15)	4.06 (2.13)	2.73 (1.79)	4.52^{f} (1.71)
	SE					0.53
	CD					1.12

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

ACKNOWLEDGEMENT

The funds provided by National Agricultural Technology Project PSR (Coastal – Agri – Horticulture) for this study is duly acknowledged.

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