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ATTRACTION OF RED PALM WEEVIL *RHYNCHOPHORUS FERRUGINEUS* OLIV. TO FERRUGINEOL BASED PHEROMONE LURES IN COCONUT GARDENS

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Abstract: With the synthesis of ferrugineol based aggregation pheromone during 1993, food baited pheromone traps have been effectively used to monitor and mass trap red palm weevil. This study, aims at assessing the weevil capturing potential of different ferrugineol based pheromone lures in palm weevil infested coconut gardens. Of the different lures evaluated in this study for attractiveness to red palm weevil, it was seen that improved ferrolure recorded the best captures. 'Ferrolure+' and ferrolure were equally effective in attracting the pest, while the use of food bait along with the pheromone lure in the trap was essential to obtain higher catches and pheromone trap captures were female dominated.

Key words : Captures, ferrugineol, lure, pheromone trap, *Rhynchophorus ferrugineus* Oliv.

INTRODUCTION

Commercial plantations of different palm species have come under the threat of the insect genus *Rhynchophorus* (Coleoptera : Curculionidae) in different parts of the world. *Rhynchophorus ferrugineus* Oliv. is a key pest of coconut and date palm in South East Asia and the Middle East, respectively. While, *Rhynchophorus palmarum* (L) is known to cause extensive damage to oil palm in Latin America. (Kurian *et al*., 1974; Abraham *et al*., 1998; Oehlschlager *et al*., 1993a.)

In India, food attractants have been used to trap and kill adults of red palm weevil *R. ferrugineus* since mild seventies, when Maharaj (1973) reported the use of metal traps containing coconut petioles to trap palm weevil adults. Later, Kurian *et al.* (1979) proved the superiority of coconut logs over metal traps. Subsequently, Kurian *et al.* (1984) showed that coconut logs treated with toddy, yeast and acetic acid were significantly superior to other food combinations in trapping red palm weevil.

Although, Hagley (1965) reported the use of a chemical mixture to attract both sexes of *R. palmarum* L, Abraham (1987) first revealed the presence of pheromone in male *R. ferrugineus.* Further, Hallet *et al.* (1993) identified the male aggregation pheromone "ferrugineol" (4-methyl, 5-nonanol) from *R. ferrugineus* and Oehlschlager *et al.* (1993a) designed a trapping system containing the pheromone, food bait (sugarcane pieces) and insecticide solution to capture red palm weevil adults using bucket traps. This trap was modified by the Ministry of Agriculture and Water, Kingdom of Saudi Arabia (Anon., 1994) to attain higher weevil catches and also achieve operational ease while trapping the pest in wide stretches of date plantations. Since 1994, pheromone traps containing ferrolure have been widely used to manage red palm weevil in several middle eastern countries (Abraham *et al*., 1998). The importance and role of pheromone trapping in palm weevil management programmes has been recently emphasized (Faleiro *et al*., 1998).

Chem Tica Natural, Costa Rica was the first to commercially produce ferrugineol based pheromone lures during 1994 and have since been widely used for palm weevil management. Subsequently, Agrisense, U.K and Calliope, France also produced ferrugineol based pheromone lures for *R. ferrugineus.*

During December 1998 and January 1999 two field trials were conducted in Goa, the coastal state of western India, to evaluate the trapping potential of different ferrugineol based pheromone lures.

MATERIAL AND METHODS

The weevil trapping potential (attractiveness) of different red palm weevil lures was

evaluated using a standard bucket trap. This trap is an upright five litre capacity -plastic bucket with a lid, having four windows (5 x 1.5 cm) cut equidistantly 3 cm below the upper rim of the bucket. Jute sackcloth was stuck to the exterior of the bucket to provide better grip to attracted weevils and facilitate their entry into the trap. Besides the pheromone lure, which was hung on the inner side of the lid, the trap also contained about 0.5 kg of food bait (sugarcane) and 1 litre of 0.1% carbaryl solution (Anon, 1994). In all, seven different treatments were set in the field. In order to evaluate the need of using the pheromone lure along with a food bait in a single trap, two treatments were devised, wherein one had only the pheromone without the food bait while the other (control) had only the food bait without the pheromone. The different treatments thus evaluated are as follows:

1. Ferrolure+ (F+)
2. Ferrolure improved
3. Ferrolure (F)
4. RF 078A210 (Part No. L 189C)
5. RF 078B210 (Part No. L 189 A)
6. Pheromone only (ferrolure)
7. Food bait only (sugarcane)

While, F+ and F of Chem Tica have been widely used in palm weevil trapping programmes since 1994, ferrolure improved, RF 078A210 and RF 078B210 have been recently developed.

The trial was conducted at two location (i) at Old Goa in the coconut plantation of the Indian Council of Agricultural Research, where no palm weevil infestation was reported throughout 1998 and a low weevil population was known to exist in and around the trial location and (ii) at Valpoi in the interior of Goa in a coconut plantation where several red weevil infested palms were detected during 1998 and a high weevil population was known to exist in and around the trial site. Each of the above field trial was run for a period of 18 days, where the first trial was followed by the second. Every treatment was replicated thrice. Care was taken to set treatments at least 25 m apart within a given replication. Also, a minimum distance of 100 m was maintained between two replications. It has been reported that palm weevil pheromone traps containing "ferrolure" when exposed to direct sunlight exhaust the chemical very fast (Faleiro *et al.*, 1999). Care was therefore taken to set the traps and the shade of palm canopy, which also helped to release the chemical uniformly into the environment.

Observations were recorded once in a week on the number of weevils captured when also, the food bait and insecticidal solution was replaced. At the end of each trial, the data was processed and subjected to ANOVA test. A combined ANOVA test was also done by pooling together data of both the trials. The results thus obtained are presented below.

RESULTS AND DISCUSSION

From Table 1, it is evident that the ferrolure improved lure recorded the highest average weevil captures at both Old Goa (Trial 1) and at Valpoi (Trial 2). The ferrolure improved lure was statistically at par with both RF 078A210 and RF078B210 in Trial 1 while it was also statistically at par with ferrolure+ in Trial 2. In the combined analysis the ferrolure improved pheromone registered the best average weevil catch of 23.46 weevil and was statistically at par with RF078A210 (Part No. L189C). It can also be seen from Table 1 that in Trial 1, Trial 2 and also in the combined analysis, both F and F+ were equally effective in trapping red palm weevil adults and the catches were statistically at par with each other. Similar results involving F and F+ were recorded in the date palm plantations of Al-Hassa in Saudi Arabia (Anon, 1998). Further, it can be seen from Table 1 that the lowest weevil captures were recorded when food bait was used alone without the pheromone lure. Also, weevil catches recorded using only pheromone without food were statistically at par when food bait was used alone without the chemical pheromone. This has shown that pheromone traps containing ferrugineol based chemical lures are effective when used together with the food bait. Tiglia *et al.* (1998) showed the necessity for the addition of a plant kairomone (sugarcane) to capture *R. palmarum* adults, with traps containing a synthetic aggregation pheromone in Brazil. The results of the study are in confirmation with those of Oehlschlager *et al.*

(1993b) who reported that the pheromone enhances the attractiveness of food-baited traps. From Table 1 it is also evident that the catches were female dominated and on an

Table 1. Attraction of red palm weevil to different ferrugineol based lures.

Sr. No.	Treatments	Average number of weevils tapped		
		Old Goa (16.12.98 to 2.1.99)	Valpoi (3.1.99 to 20.1.99)	Cumulative average*
1	Ferrolure + (F+)	2.02 (4.09)	2.93 (8.57)	3.65 (13.30)
2	Ferrolure improved	3.25 (10.56)	3.62 (13.08)	4.84 (23.46)
3	Ferrolure (F)	2.00 (4.00)	2.47 (6.10)	3.10 (9.61)
4	RF078A210 (Part No. L 189 C)	2.73 (7.43)	2.91 (8.49)	3.95 (15.58)
5	RF 078B210 (Part No. L 189 A)	2.26 (5.11)	2.83 (7.99)	3.54 (12.56)
6	Pheromone only (ferrolure)	1.34 (1.80)	1.10 (1.20)	1.64 (2.69)
7	Food only (sugarcane pieees)	1.27 (1.60)	0.88 (0.77)	1.35 (1.82)
	CD (0.05)	1.03	0.96	1.20
	Male : female ratio	1 : 1.6	1 : 1.2	1 : 1.81

*Data pooled replication wise.
Data transformed using (X + 0.5) where X is the average number of weevils trapped. Figures in parentheses are actual values

average for every male captured 1.81 female weevils were trapped. Oehlschlager *et al.* (1995) reported female dominant captures with pheromone traps used to manage *R. palmarum* in oil palm plantations of Costa Rica. A similar trend was seen when *R. ferrugineus* was trapped in Saudi Arabia with pheromone traps in a mass trapping programme in date palm (Anon, 1998). Trapping higher number of female as compared to male weevils is a desired trait as the pheromone trapping programme, besides monitoring the activity of the pest would also substantially reduce the build up of the pest population.

This study has therefore shown that (i) ferrolure improved recorded the best weevil catches and was statistically at par with RF078A-210 (Part No.L189C) (ii) both F and F+ were equally effective in trapping the pest (iii) it is essential to use ferrugineol based pheromone lures along with a food bait and (iv) pheromone trap captures were female dominated.

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