A comparative study on the efficacy of pheromone lures in trapping red palm weevil, *Rhynchophorus ferrugineus* Oliv. (Coleoptera : Curculionidae) in coconut gardens

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Abstract

A field trial was conducted to assess the efficiency of different pheromone lures in trapping coconut red palm weevil, *Rhynchophorus ferrugineus* Oliv. The results revealed that two formulations of AgriSense, UK, *viz.* RF 078B210L189A and RF 078A210L189C and Chem Tica formulation ferrolure + were equally effective in trapping the weevil. Because of the visibility of the pheromone in the sachet the monitoring for replacement of the empty lure by the user was possible with Chem Tica ferrolure + and this is an added advantage. It is also found that effective weevil trapping is possible only if pheromone is used along with the food bait.

Introduction

Rhynchophorus ferrugineus Oliv. (Coleoptera : Curculionidae) the red palm weevil, is a very dangerous pest of coconut palm in India. Recently this pest has devastated large number of date palms in Gulf countries and forced many farmers to abandon their plantations.

Red palm weevil is a concealed tissue borer and in majority of cases the pest infestation leads to death of the affected palm. Since the grubs are internal feeders, the symptoms manifested on the infested palm are exhibited very late. This makes the early detection of the infestation rarely possible and thus taking up the curative treatment at the appropriate time difficult. Thus tackling the pest becomes a tough challenge. An Integrated Pest Management (IPM) schedule was developed by Abraham *et.al.* (1989) to effectively manage this pest in coconut plantations. Use of coconut log traps baited with toddy/ pineapple/sugarcane + yeast + water and insecticide to attract and kill the floating population of red palm weevil was one of the components of the above IPM (Kurian *et.al.* 1984)

Abraham (1987) through laboratory studies revealed the presence of pheromone in male red palm weevil. Hallet *et.al* (1993) isolated the male produced aggregation pheromones 4-methyl -5- nonanole (ferrugineol) and 4 - methyl - 5-nonanone (ferrugineone) from red palm weevil. A mixture of ferrugineol and ferrugineone (both synthetic) was made commercially by Chem Tica International, CostaRica and was named as ferrolure +. Subsequently another long term version of ferrolure + was also made available. Recently AgriSense BSC Ltd, United Kingdom, also produced this pheromone mixture in two formulations and has code named them as RF 078B 210 Part L189A and RF 078A 210 Part L189C. In the present study these four formulations were tested in coconut gardens in Kerala, India, to assess the trapping efficiency and the results obtained are discussed below.

Materials and Methods

Traps for testing the pheromone lures were made using five litre capacity plastic buckets having lids. Four windows of 2.5cm x 5 cm size were cut equidistant at the top, just below the upper rim of the bucket. Jute cloth (gunny) was stuck on the outer side of the bucket to provide better grip for the attracted weevil to get into the bucket. Pheromone lure was hung on the inner side of the lid using a metal wire (Abraham *et. al.* 1998). A food bait of pineapple - 100g, yeast - 2g and carbaryl - 5g mixed in one litre water was provided in the bucket.

There were six treatments *i.e.*, four pheromone lure formulations and two controls as detailed below.

T1 - Chem Tica lure Ferrolure +
T2 - Chem Tica lure Ferrolure + long term
T3 - AgriSense code : RF 078B 210 Part L189A
T4 - AgriSense Code : RF 078A 210 Part L189 C
T5 - No lure - food bait alone
T6 - Ferrolure +, no food bait, 0.25 percent carbaryl solution alone.

A distance of 25 m was maintained between treatments and 250m between replications. There were four replications. The experiment was conducted for a period of four weeks. Traps were serviced by washing and providing fresh food bait on every seventh day before which number of weevils trapped were recorded. Data on the weevil catch thus obtained was statistically analysed using ANOVA

after the $\sqrt{x + 0.05}$ transofrmation of the original values.

Results and Discussion

The results of the experiment are given in *Table 1*. It can be seen from the table that there was significant difference between the treatments T1 to T4 and the controls, T5 and T6. When traps were set with food bait alone and no pheromone or pheromone alone and no food bait, weevil catch was reduced drastically. In T5 with food bait alone, reduction in weevil capture was 27.5 times when compared to T3 which captured the highest number of weevils. Similarly, reduction of weevil capture was 17.7 times in T6 with pheromone lure alone. It is evident that for effective trapping of the weevils which are attracted by the pheromone, a food bait is essential in the trap. The pheromone acts synergistically with the volatiles of the food bait. Weevils which are attracted towards the trap by pheromone lure after landing on the surroundings of the trap, crawl and enter inside the trap.

Treatment T3, T4 and T1 having mean weevil catch of 7.13, 5.75 and 5.31, respectively were statistcally on par. Both the AgriSense pheromone lures and ferrolure + of Chem Tica were equally efficient for weevil catch. Long term ferrolure + of Chem Tica (T2) captured the lowest number of weevils among the four phermone treatments. However, the catch was statistically significant with AgriSense lure L 189C and Chem Tica ferrolure+.

Chem Tica pheromone is light bluish violet in colour and is visible through the septa of the white polythene sachet/dispenser. AgriSense RF078B210 L189 A (T3) is contained in opaque plastic vial and the contents are not visible. In AgriSense L189C (T4) both the pheromone and the polythene sachet are transparent and hence it is very difficult to make out the presence / level of the pheromone content inside. In order to maintain the efficiency and continuity of pheromone trapping system it is essential to have a continuous release of the pheromone into the environment. This is possible only if the exhausted lures are identified in time and replaced with fresh ones (Faleiro *et.al.* 1999). Chem Tica ferrolure + (T1) has got an advantage over the AgriSense lures because of the visibility, thereby fulfilling the above requirement. It can be concluded that Chem Tica pheromone lure ferrolure + and AgriSense pheromone are equally efficient in trapping the red palm weevil adults and the former has the advantage of visibility which is helpful in replacing the lure sachet at the proper time. Also, for effective weevil capture pheromone traps are to be set with food bait and pheromone lure.

***Table 1. Number of Rhynchophorus ferrugineus* Oliv. adults captured using different formulations of aggregation pheromone lures (after $\sqrt{x + 0.05}$ transformation).**

Treatment	Week 1	Week 2	Week 3	Week 4	Mean
T1	1.77 (2.8)	2.33 (5.5)	2.48 (6.0)	2.68 (7.0)	2.32 (5.31)
T2	1.73(2.8)	2.03 (3.8)	1.82(3.0)	3.25 (10.3)	2.21(4.94)
T3	2.65(6.8)	2.45(5.8)	2.38(5.5)	3.23(10.5)	2.68(7.13)
T4	2.15(5.0)	2.48(6.3)	2.27(5.3)	2.59(6.5)	2.37(5.75)
T5	0.84(0.3)	0.71(0)	0.93(0.5)	0.84(0.3)	0.83(0.25)
T6	0.84(0.3)	0.71(0)	1.09(0.8)	0.97(0.5)	0.90(0.38)

C.D. (p=0.05) for treatment = 0.362
Figures in parentheses denote the average weevil capture in the respective week.

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