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MASS TRAPPING OF RED PALM WEEVIL AND RHINOCEROS BEETLE IN COCONUT WITH AGGREGATION PHEROMONE

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ABSTRACT

Field studies and front line demonstrations were conducted during 2017-2019 to popularise the pheromone technology for wide area management of red palm weevil *Rhynchophorus ferrugineus* and rhinoceros beetle *Oryctes rhinoceros* in coconut plantations at Goa. Red palm weevil activity was observed throughout the experimental period, with maximum being during post monsoon period between October and November. Its' least activity was during pre and monsoon period during April to June. The maximum attraction of *O. rhinoceros* was observed during July and September. Captures in the pheromone traps were female dominated, with overall sex ratio (male: female) of red palm weevil and rhinoceros beetle being 1:2.97 and 1:1.56, respectively. About 64 and 50 % reduction of damage symptoms of red palm weevil and rhinoceros beetle was observed in pheromone implemented plantations. Thus, continuous mass trapping of red palm weevil and rhinoceros beetle through pheromone technology significantly reduces the infestation in coconut plantation.

Key words: *Rhynchophorus ferrugineus*, *Oryctes rhinoceros*, pheromone trap, seasonal variation, sex ratio, wide area management, coconut

Coconut (*Cocos nucifera* L.) is an important plantation crop and provides livelihood securities to millions of small and marginal farmers in India (Rethinam and Singh, 2007). The crop is cultivated in an area about 20.96 lakh ha with an annual production of 23798 million nuts and productivity of 11350 nuts/ ha (CDB, 2018-19). Various biotic and abiotic factors are responsible for limiting its production and productivity. The coconut palm is attacked by large number of insect pests of which the red palm weevil (RPW) *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) and rhinoceros beetle (RB) *Oryctes rhinoceros* (Coleoptera: Scarabaeidae) are more serious. Red palm weevil alone damages about 12% of young coconut palms in the age group of 5 to 20 years (Faleiro, 2005). It is an internal tissue borer and very difficult to detect in the early stages of infestation. Rhinoceros beetle causes damage to unopened leaves, spathes and bud region in the crown reducing the yield up to 10% (Sujatha et al., 2010). The damage of RB paves the way for RPW infestation. Both the pests are serious threat to coconut plantations.

Implementing of mechanical/ physical/ chemical method of control is very difficult due to greater height of the palms (usually 10-20 m) and non-availability of skilled labourers to execute the pest management practices in coconut plantations (Faleiro, 2006). Presently, the use of pheromone traps has been encouraged as an alternative (Maruthadurai and Ramesh, 2019). Large scale mass trapping of RPW in coconut in Kerala significantly reduced the population density (Jayanth et al., 2007). Mass trapping of red palm weevils and rhinoceros beetles help to capture and destroy a sizeable amount of floating weevils and beetles and thus, help in reducing the population (Sujatha et al., 2010). Farmer participatory and community based approach are essential for mass trapping and successful management of RPW and RB in coconut plantations. So far no attempt has been made on wide area management of these two insect pests in Goa. Hence, the present study was undertaken on wide area management of RPW and RB in coconut plantations of Goa.

MATERIALS AND METHODS

Front line demonstrations and field studies were conducted in coconut plantations of Goa on use of pheromone traps for the management of RPW and RB during 2017-2019. The pheromone bucket traps, ferrolures and rhinolures @ 350 mg were procured from Pest Control India Ltd. Kairomone releasing food baits viz., coconut petiole and sugarcane pieces (approximately 200 g) were added to inside the bucket

trap containing one litre of insecticidal solution (0.05% chlorpyriphos). The trap was tied to the coconut tree/ with the other tree at 1 m height preferably under the shade of the tree at the periphery of the plantations. A total of 550 each of ferrolures and rhino lures with bucket traps were distributed to the coconut growers both in North and South Goa districts. The farmers were trained and demonstrated on use of pheromone traps, food baits, trap servicing, lure placement and replacement etc. Twelve field demonstrations were done in approximately in 35 ha. The pheromone traps were placed in August 2017 and continued till August 2019. Attracted weevils and beetles were counted at weekly interval and sex ratio was calculated. The trap was serviced at fortnightly interval and replaced with food baits and insecticidal solution. The pheromone lure was changed at four months interval. To compare the effect of pheromone trapping technology, damage symptoms of RPW and RB was recorded in selected five plantations before and after the field trail (Jayanth et al., 2007; Sujatha et al., 2010; Chakravarthy et al., 2014).

RESULTS AND DISCUSSION

Monthwise trap catches of RPW and RB for the period between August 2017 and August 2019 are presented in Fig. 1 and 2. The catches of weevils and beetles/ trap/ week varied with maximum catches of 17.05 adults of RPW/ trap observed during November 2017. The least of RPW catches were during June and July. During 2018-19, the maximum attraction of 14.4 adults of RPW/ trap was in November whereas minimum attraction of 2.05 adults/ trap was in March. However, RPW activity was observed throughout the experimental period. The maximum weevil activity was observed during post monsoon period between October and November whereas the least activity was during pre and monsoon period from April to June.

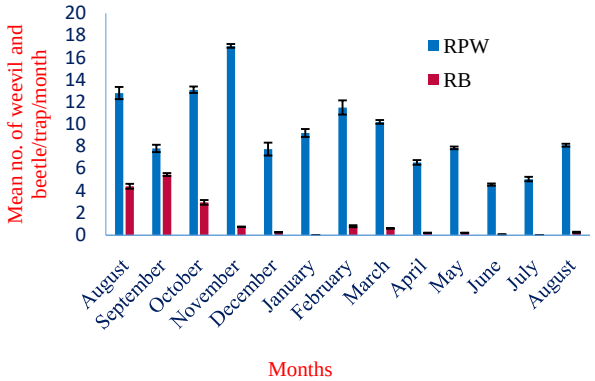

Fig. 1. Attraction of RPW and RB in the pheromone traps (August 2017 - August 2018)

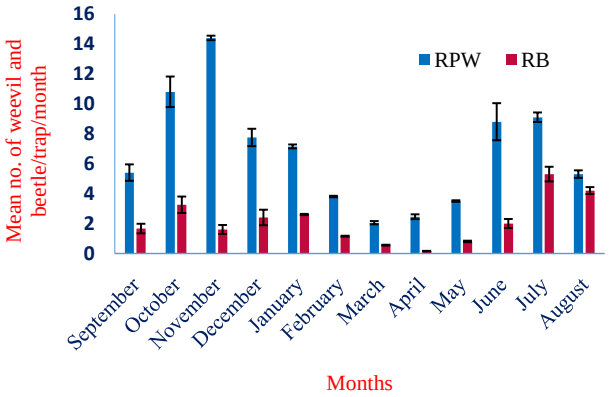

Fig. 2. Attraction of RPW and RB in the pheromone traps (September 2018 to August 2019)

Chakravarthy et al. (2014) found that RPW attraction varied from 0.25 to 13.25 beetles/ trap/ week during 9th to 53rd week in Honnaganahalli district of Karnataka. The present findings agree with those of Faleiro (2005) who reported that weevil activity was maximum after south west monsoon between October and November, while the least activity was during monsoon between June and July.

The rhinoceros beetle caught in the pheromone traps ranged from 0 to 5.46 beetles/ trap/ month during 2017-18. The maximum catches of 5.46 beetles/ trap was found during September whereas lowest was in June. There was no activity or attraction of RB in January and July. During 2018-19, the maximum catches of 5.3 beetles /trap was in July whereas lowest of 0.15 adults/ trap was in April maximum. This is the first story on the population dynamics and behaviour of RB in coconut ecosystem of Goa. The present findings are in agreement with the reports of Chakravarthy et al. (2014) which revealed that the peak activity of beetles was found during 29th to 53rd week i.e., from September to March. The beetles attracted in the traps ranged from 0.0 to 4.5 beetles/ trap/ week. Number of rhinoceros beetles/ trap/ month ranged from 0.65 to 7.5 with maximum catches in April, May, June and again in September and October under east coast conditions (Sujatha et al., 2010). The weevil and beetle captured in the pheromone traps were found female biased. The overall sex ratio of RPW was 1:2.97 whereas for RB it was 1:1.56. Trapping the female population would have a direct impact on the population reduction of the RPW and RB in the subsequent generations. These results are in accordance with Faleiro (2005) who found that the RPW captured in the pheromone traps were female dominated. Similar results had been reported earlier (Poorjavad et al., 2009; Srinivasan et al., 2018).

About 64 and 50% reduction of damage symptoms of RPW and RB damage was observed in pheromone implemented plantations compared to pretreatment observations. The present findings are in accordance with Saminathan et al. (2019) who found that at the end of six months mass trapping programme trees with RPW symptoms and RB symptoms were 24.28 and 15.71% in demonstration plots against 44.28 and 22.80% in control, respectively. Sujatha et al. (2010) revealed that 27.3 and 59.9% reduction in leaf and spindle damage by RB in pheromone implemented coconut plantations. The use of pheromone trap for RPW was found to effectively reduce the palm damage by 78%. This study successfully demonstrated the pheromone technology for wide area management of RPW and RB and reported first time the population dynamics of RB in this region. Results suggest that continuous mass trapping of RPW and RB over a period of time, significantly reduced the infestations in coconut plantations. The present study also highlighted the scope of wide area management of RPW and RB in coconut ecosystem of Goa.

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