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**THE EFFICACY OF RYNCHOLURE® IN TRAPPING *RHYNCHOPHORUS PALMARUM* L. THE VECTOR FOR RED RING DISEASE OF COCONUTS IN TRINIDAD**

*Chanderbhan Shripat, F. Hosein, and A. Baksh, Ministry of Food Production, Land and Marine Affairs, Central Experiment Station, Research Division, Centeno, via Arima P.O., Trinidad*

*[c\\_shripat@yahoo.com](mailto:c_shripat@yahoo.com)*

**ABSTRACT:** The coconut palm weevil, *Rhynchophorus palmarum* L. (Coleoptera: Curculionidae) is a serious pest of coconuts (*Cocos nucifera* L.) in Trinidad. *Rhynchophorus palmarum* can cause direct as well as indirect damage to coconut trees. Apart from causing death of trees or little leaf syndrome, it is the vector of the nematode *Bursaphelenchus cocophilus* which causes red ring disease. This disease has been devastating the coconut industry for over 100 years and trees between 3-10 years old are highly susceptible. Management of the disease has been through field sanitation and trapping of *R. palmarum*. Trapping of the vector has been demonstrated to reduce the incidence of red ring disease in Malaysia, Brazil and Costa Rica. Traps were used with the aggregation pheromone Rhynchophorol (Rhyncholure®) together with sugarcane or fruit baits and an insecticide. In September 2010 a pre-trial was initiated at four locations in Trinidad to examine the efficacy of using baited traps with Rhyncholure® in reducing populations of *R. palmarum*. Each location was isolated from one another by several kilometres and comprised approximately 1.0 hectare with about 200 coconut trees that were less than 10 years old. At each location one trap made of a discarded 4-litre oil container containing the lure, sugarcane bait and a carbamate insecticide was placed about 1.5 metres high on a leaf petiole close to the trunk of the coconut tree in the middle of the field. The traps were examined weekly for a period of 16 weeks and the number of coconut palm weevils was recorded. The sugarcane bait and insecticide were changed bi-weekly. A total of 651 of these insects was collected over the period with the highest number at Centeno (255) followed by Valencia (186), Carlsen Field (151) and Kelly (59). The results show that the trapping system used was effective in trapping *R. palmarum* and thus reduce their population in the environment. Based on the data gathered, long term trials will now be established to manage *R. palmarum* and in so doing manage the spread of *Bursaphelenchus cocophilus* the causal organism of red ring disease.

Keywords: *Rhynchophorus palmarum*, trapping, Rhynchophorol, *Bursaphelenchus cocophilus*

## **INTRODUCTION**

Coconut (*Cocos nucifera* L.) is an important agricultural crop in Trinidad and Tobago. It is widely used in the fresh state for coconut water or the copra is processed for oil, soaps and perfumes. Coconut milk is also used in culinary delights. The coconut plant adds to the rich biodiversity and has aesthetic value in beautifying a country's landscape.

Apart from socio-economic reasons, pests and diseases are important factors affecting production. The crop has been on the decline for a number of years and consequently has been identified as a priority crop in the Ministry's Action Plan (MFPLMA, 2010). Red ring disease was first reported in Trinidad in 1905 (Hart, 1905) when several thousand trees were destroyed. It is caused by the nematode *Busaphelenclus (Rhadinapelenclus) cocophilus* (Cobb, 1919; Goodley, 1960) and is one of the most destructive pests of coconut. The nematode is vectored by

the coconut palm weevil *Rhynchophorus palmarum* L. (Coleoptera: Curculionidae) (Griffith, 1968), which can also cause direct damage to the palm by extensive feeding of the larvae to the crown (Griffith, 1987).

In Trinidad it is estimated that red ring disease kills 35 percent of young coconut trees and in Venezuela 35 percent of oil palms died over a ten-year period. In Grenada, 22.3 percent of coconut trees were infected with *B. cocophilus*, 92 percent of which was infested with the coconut palm weevil. There appears to be a synchronized distribution of both *B. cocophilus* and *R. palmarum* from Mexico to South America including the Caribbean (Brammer and Crow, 2001). Red ring disease also affects other tropical palms including date (*Phoenix dactylifera*), Canary Island date (*Phoenix canariensis*) and Cuban royal (*Roystonea regia*); however, it is more associated with coconut and oil palms (Brammer and Crow, 2001). It is also estimated that 72 percent of palm weevils carried *B. cocophilus* (Esser and Meredith, 1987).

Three to 10-year-old coconut palms are highly susceptible and die within two months of infection. External symptoms are manifested in the leaves which wilt, turn yellow from the tip of the leaflets to the base of the rachis, then turn brown. Leaf symptoms usually start on the lower leaves and progress upwards (Griffith, 1987). The major symptoms, however, can be seen from a transverse section of the trunk of the infected tree, which is a band of discoloured tissue within the cortex, giving the characteristic red ring. Symptoms are also seen on the roots and petioles (Griffith, 1987).

Several methods have been used to manage *R. palmarum* and hence red ring disease. The use of chemicals against the palm weevil has not been successful (Hagley, 1963). Cultural methods by removal of diseased trees with aboricides or cutting and burning eliminate the inoculum as well as the host (Griffith, 1987).

In Mexico, the incidence of red ring disease declined from 10.0 percent to 1.0 percent when *R. palmarum* was controlled (University of California, Denver, Department of Nematology, 2002). The effect of trapping *R. palmarum* drastically reduced the incidence of red ring disease in Brazil (Chinchilla, 1991.) (Denise Navia, *personal communication*). Trapping captures adults and there is a decline in future generations of *R. palmarum*. Griffith (1987) recommended a trapping system using guard baskets with fresh tissue from diseased palms sprayed with a 0.1 percent methomyl solution to trap the palm weevil. Other trapping systems have been tried in Trinidad with inconclusive results (Cooper *et al.*, 2000). Servicing these traps was cumbersome since they required diseased tissue as bait.

More recently mass trapping using the synthetic aggregation pheromone Rhynchophorol (Rhyncholure®) together with sugarcane baits have been successful in Costa Rica in reducing population of *R. palmarum* and consequently reducing the incidence of red ring disease (Gibbin-Davis *et al.*, 1995; Oehlsachlager *et al.*, 1995).

The objective of this study was to examine the efficacy of using baited traps with Rhyncholure® in reducing populations of *R. palmarum* in small holdings of 1-2 hectares. The outcome of which will inform on executing longer term trials for management of red ring disease.

## MATERIALS AND METHODS

Four small coconut farms comprising of 1.0 hectare each with approximately 200 young trees (less than 10-year old) were selected for the trial. These farms were located approximately 10 kilometres apart at Kelly, Centeno, Valencia and Carlsen Field (Appendix I).

Each trap was made with a 4-litre discarded oil container. Two vents were made on the broad sides of each container to allow for entry of the insect. Four pieces of sugarcane about 15 cm. long were halved longitudinally and placed at the bottom of each container and 5.0 g carbaryl insecticide was applied over the sugar cane bait. The lure was hung from the top of the container by a 15-cm long piece of wire.

At each location, one trap was tied to a coconut tree in the middle of the field, about 1.5 m high, on a petiole close to the trunk. The traps were examined weekly for 16 weeks and the number of coconut palm weevils was recorded. The sugarcane bait and insecticide were changed biweekly.

## RESULTS AND DISCUSSION

Over a 16-week period from September 2010 to December 2010 a total of 651 coconut palm weevils (*R. palmarum*) were captured at the four locations. The highest number (255) was captured at Centeno followed by Valencia (186), Carlsen Field (151) and Kelly (59). The highest number captured per trap per week was 61 which were observed on the fourth week at Centeno (Table 1).

Table 1. The number of coconut palm weevils collected from 6<sup>th</sup> September, 2010 to 20<sup>th</sup> September, 2010 at four (4) locations in Trinidad

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Mean
Valencia	45	24	16	26	3	0	16	36	12	8	0	0	0	0	0	0	186	11.62
Centeno	39	33	28	61	6	28	5	23	23	6	0	0	3	0	0	0	255	15.94
Kelly	9	11	0	2	10	15	2	2	1	3	4	0	0	0	0	0	59	3.69
Carlsen Field	13	5	5	5	12	26	8	10	4	2	1	12	18	8	12	10	151	9.44
Mean	26.5	18.3	12.3	23.5	7.75	17.3	7.75	17.8	10	4.75	1.25	3	5.25	2	3	2.5	651	*10.17

\* s.d. ( $\pm$ ) 8.14

The mean number of coconut palm weevil captured was 10.17 ( $\pm$  8.14) per trap per week. In Malaysia, a mean of 8.65 ( $\pm$  7.26) weevils per trap per week was captured on oil palms over a 16-week period (Oehlschlager *et al.*, 1992). After the ninth week there was a drastic reduction in weekly captures per trap which could be attributed to reduction in populations of *R. palmarum* and /or depletion of liquid pheromone from the lure. Oehlschlager *et al.*, (1992) reported that the lure releases pheromone for 3 to 4 months after which time it should be changed.

The mean population increased after changing the bait on the third, fifth and seventh week (Figure 1). The decrease during the other weeks may be due to a decrease in plant odors (sugar cane bait) which are needed for attracting the insect, since the pheromone by itself is only capable of attracting palm weevils to a limited distance (Oehlschlager *et al.*, 1993).

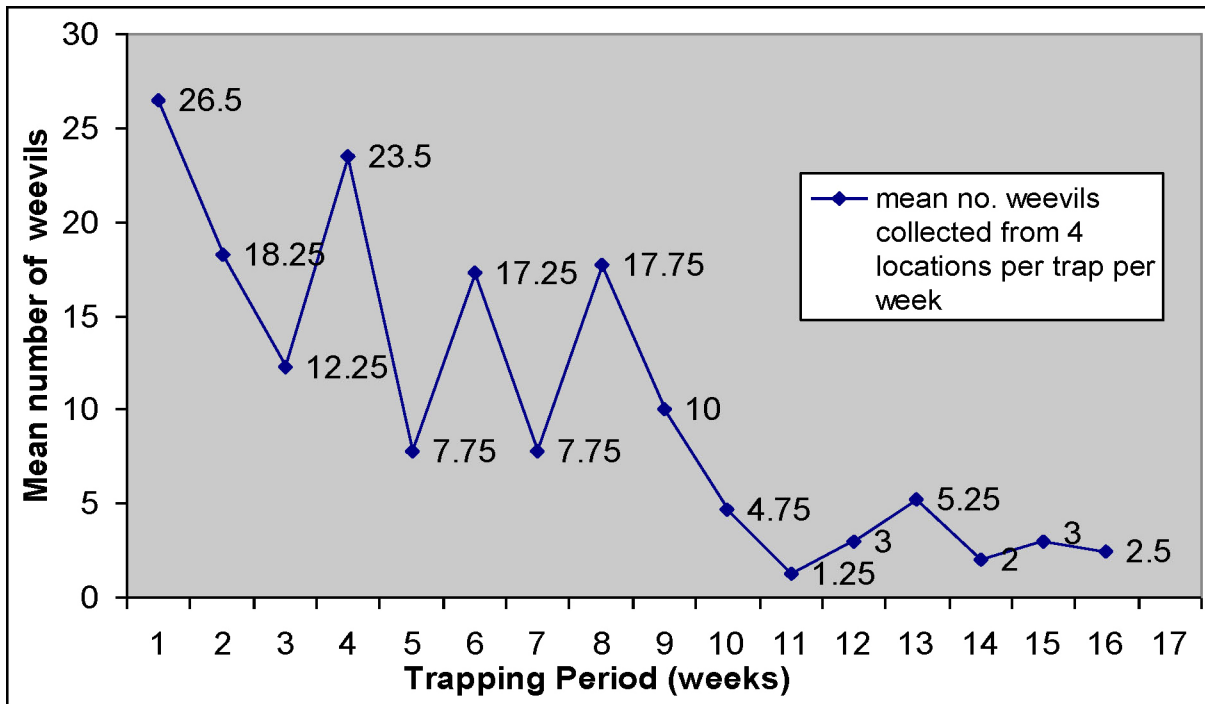


Figure 1. The mean number of coconut palm weevils collected at four (4) locations duration a 16 week period.

The results demonstrate that the trapping system using the lure, sugarcane bait and carbaryl was effective in capturing *R. palmarum* and thus reduce its population in the environment.

Based on the data gathered, traps may become more effective if sugarcane bait is changed weekly instead of biweekly, which is consistent with investigations by Oehlschlager *et al.* (1992). Long term trials can now be established to manage *R. palmarum* and in so doing manage the spread of *Busaphelenchus cocophilus*, the causal organism of red ring disease, since reducing the population of *R. palmarum* is highly recommended as a strategy for lowering the incidence of red ring disease (Griffith, 1987).



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Appendix I. The location of trial sites at Kelly, Centeno, Valencia and Carlsen Field, Trinidad, 2010

