Habitational Study on RPW of Coconut Palm Tree

Leena Nangai V
Research Scholar, Sathyabama Institute of Science & Technology
Chennai, India
leenanangai@gmail.com

Dr. Betty Martin
Department of ECE, Shanmuga arts science technology research academy,
Thanjur, India
bettymartin1205@gmail.com

Abstract:
A theoretical study was conducted in two different coconut fields to observe the characteristics, damages caused, symptoms of the palm tree diseased and the methods to identify the presence of the coconut palm tree's major pest namely the Red Palm Weevil and surveyed about its co-worker Rhino-beetle. Perceived the severity of the infestation due to the presence of these pests and the methods practised for controlling the major pests of the coconut palm tree. The acoustics of these pests were recorded separately and tried to distinguish manually by visual inspection method. The acoustical characteristics of the pest can be incorporated into a device for discovering their presence (mainly RPW) in the earlier stage than the traditional methods like bucketing method or visual inspection method.

Keywords: *Redpalm weevil, Rhino-beetle, bucketing method, visual inspection method*

I. INTRODUCTION

The Red palm weevil and the Rhino beetle are considered as the prime pests that affect the coconut palm tree cultivation are shown in the figure 1. A century ago RPW was originated in South East Asia and Malensia. Later in 1980's it was found in Southern Europe. Red palm weevil is also known as "Asian palm weevil" or "Sago palm weevil". The Scientific name of the weevil is "Rhychophorus Ferrugenius" It is seen as a mortal insect of palm trees like coconut palm, date palm, oil palm and sago palm. This weevil has different stage in its [ince, 2012] life cycle namely egg, larva, cocoon and the adult which is shown in the figure 2a. The larvae stage is the fatal stage that affects the palm tree and detecting its presence at an early stage using traditional methods has become a challenge for the farmers.


a) Red Palm Weevil

b) Rhino Beetle
Figure 1

Investigations on detecting the RPW larvae using the acoustical characteristics are

being carried by many scientists to save the palm tree cultivation. The previous works in exposing the presence of the larvae inside the palm tree involved more technical people to perform [Leena Nangai , 2017]. Also, most of the examination on instar characteristics were done in a controlled environment either by collecting the acoustics from the field [Betty Martin, 2015] or by injecting the larvae inside the palm tree by making drills to multiply inside and read the temperature of the tree at regular intervals. Scientist also proposed [Richard W. Mankin, 2011] a method to follow before developing an instrument which could help in capturing the presence of the larvae based on its acoustics. Wireless sensor was fixed on the tree at different heights and grouped the palm trees as an array to detect the presence of the larvae [Swarnalatha Srinivas, 2013]. In [Betty Martin, 2013] vector quantisation method was implemented in the detecting the presence of the weevil using acoustical method and the frequency of the RPW was found to range between 184 hz to 4591 hz.
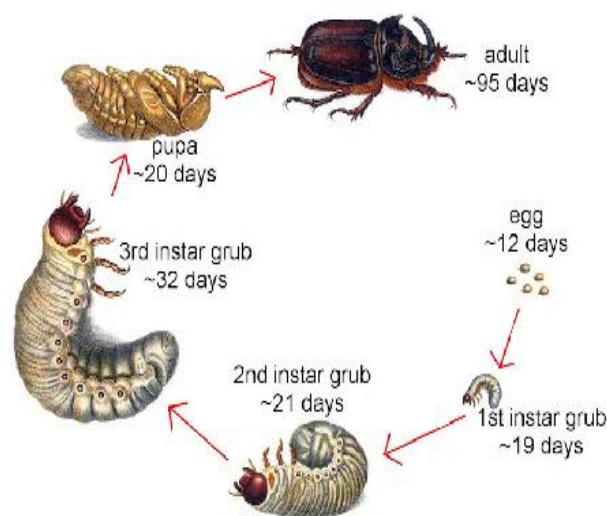
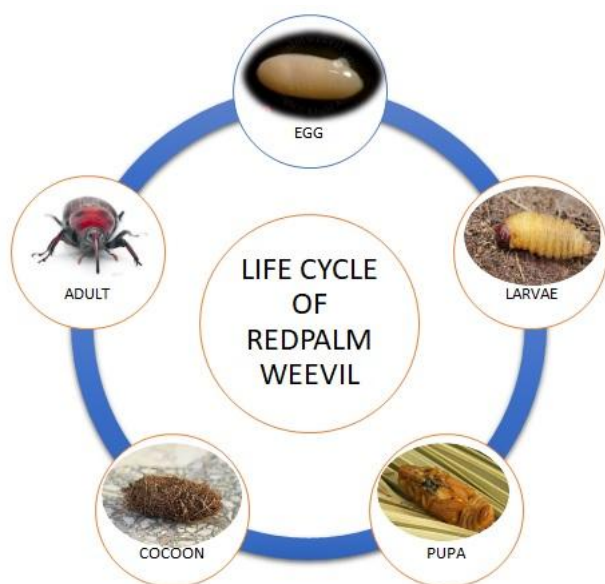*a) Life cycle of RPW*

b) Life cycle of Rhino beetle

Figure 2 (courtesy google images)

Oryctes rhinoceros is the binomial name of the Rhino beetle which is most likely to be found along with its associate RPW. It is the Asia's native breed. The Rhino beetle also has different stages of life cycle like the egg, larvae, pupa and the adult which is represented in the figure 2b [Caleb Hsu, 2015]. Here the adult beetle is the one which causes damage to the palm tree. The adult beetle is dark brown in colour and grows up to 6cm.

II.   FIELD STUDY

The field inspection on for analysing the behaviour of the pest and damages caused by it was carried out in two different fields in the month of August 2018 at C. Pudupatti, Cumbum, Theni district, Tamil Nadu and in the month of September 2018 at a small village near Dharapuram, Tirupur district Tamil Nadu. The main purpose of this field study is to know how the RPW larvae infects the palm tree, what are the methods the farmers are practising to overcome the larvae's spoliation action and to read its acoustical characteristics.

As seen in both the coconut farms the RPW larvae has been a big worry for the farmers. They are practicing the traditional methods like

visual inspection and bucketing method to identify the presence of the larvae. There was a brown liquid with a foul smell oozing out from the tree and holes were present which was an evidence for the presence of the RPW larvae which is shown in figure 5. When the farmer finds these symptoms, they kept their ears on the tree to notice whether they could hear the acoustics of the RPW. If they hear the larvae acoustics they confirm the presence of the larvae in the tree and take necessary steps to clear the larvae.

The RPW larvae stays inside the palm tree feeding on its soft tissues and drills from inside making the palm tree weak. This damaging of the larvae is not evident in the early stage of it feeding because the tree looks healthy from outside. Only when the feeding activity of the larvae increases the tree becomes weak and die. The figure 3 shows such a completely dead tree which occurred due to the larval feeding on the tree. The link https://youtu.be/NLx5a24Q2QI shows the recorded video of the larvae's drilling action which helped to analyse its action.

Figure 3 – Damaged tree due to RPW larvae

In both the farm fields they have installed bucketing system to capture the adult RPW which is show in figure 4. The bucket consists of a small sachet of pheromone lure chemical at the centre of its lid whose fragrance attracts the adult weevil and traps it inside the bucket by making it fall inside the water. Once the weevil falls in the water it cannot come out of the bucket. If any weevil is trapped inside the bucket the farmers understand that the RPW is present in the farm and try to identify visually which tree is infected by the RPW larvae. The figure 5 represents the visual symptoms shown due to the presence of the larvae.

Figure 4 – bucketing method trap for RPW

Rhino beetle was also found in both farms which is RPW's co-worker in affecting the coconut palms. The adult beetle lay eggs in the decaying logs or decomposing organic matter that is present near the palm tree. The larvae were found feeding on already decaying element and in the holes made by the RPW larvae. The triangle cuts in the fronds of the palm tree indicates the presence of the Rhinobeetle. Also holes in the spindles indicates the presence of the weevil. The beetle stays at the centre of the crown of the palm tree feeding on the unfold fronds causing the mentioned damages. When the feeding of the beetle increases it slows down the palm tree's growth giving rise to fungal infections which in turn affects the yield

Figure 5 – Symptoms of RPW larvae affected tree

Figure 6 - Rhino-beetle affected tree

In the farm field at C.Pudupatti, Tamil Nadu a separate trap was installed on the ground in a mud pot for the trapping the adult rhino beetle weevil. The mixture inside the pot was made of 1kg of castor oil cake and a hand full of thimet pesticide (about 20gms) mixed in 4ltrs of water. The trap installed in the field is shown in figure 7.

Figure 7 – Traps used in the investigated farm for trapping the Rhino-Beetle

The farmers believed that the Rhino beetle can be controlled by keeping the surrounding of the farm clean and clearing the decaying logs and the decomposing elements properly. They also

believe that the attack of the adult beetle is one of the reasons for attracting the RPW adult for laying eggs. They believe that when the beetle bites the unfold fronds the smell of the attacked fronds mix in the air and attracts the red palm weevil adult to lay its eggs.

III.   OBSERVATION

It was perceived from both the farms that the Red Palm Weevil and the Rhino beetle is the serious fret for the farmers. These two pests play an important role in infecting the growth of the tree which are less than 10years and causing less yield for the farmers. The presence of the Rhino beetle is easily identified, and steps were taken destroy it. But RPW is a big challenge for the farmers to identify and save the tree from its deathbed. The traditional methods (visual inspection and bucketing) practiced in these farms will not help the farmers to save their tree and increase its yield. When the RPW was found in the farm, the farmers try to identify which tree is affected. The RPW larvae were found feeding at the crown and moving downward drilling palm tissues.

IV.   CONCLUSION

The traditional method makes it unfathomable in spotting the presence of the RPW larvae at an early stage to save the tree. Deployment of acoustical method in identifying the presence of the larvae at an early stage could help to save the palm tree which in turn help the farmer to increase the yield. The acoustical method should be easily handled by the farmer without any scientific persons help.

REFERENCES

[1]   Betty Martin, 2015,” *A relative analysis on sound of Red Palm Weevil based on field and lab recordings*”, International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 6

[2]   Betty Martin, Vimala Juliet, “*A Novel Approach to Identify Red Palm Weevil On Palms* “, Advanced Materials Research Vols. 634-638 (2013) pp 3853-3857

[3]   http://rpw-pa.ari.gov.cy/pdf/lifecycle.pdf

[4]   https://plantvillage.psu.edu/topics/coconut/infos

[5]   http://agritech.tnau.ac.in/crop_protection/coconut/crop_prot_crop_insect_oil_coconut_1.html

[6]   http://hsu352.wixsite.com/entm105-rhinobeetle/references

[7]   Ince, Sahin & Porcelli, Francesco. (2011), “*Egg laying and egg laying behavior of Red Palm Weevil, Rhynchophorus ferrugineus (Olivier)*”, Agriculture and Biology Journal of North America. 2. 1368-1374. 10.5251/abjna.2011.2.11.1368.1374.

[8]   Leena Nangai V, Dr. Betty Martin, *“Interpreting the Acoustic Characteristics of Rpw Towards Its Detection- A Review”,* IOP Conf. Series: Materials Science and Engineering 225 (2017) 012178 doi:10.1088/1757-899X/225/1/012178

[9]   Richard W. Mankin, 2011, “*Recent developments in the use of acoustic sensors and signal processing tools to target early infestations of red palm weevil in agricultural environments*”, Florida Entomological Society, Florida Entomologist, 94(4):761-765. 2011. URL:
http://www.bioone.org/doi/full/10.1653/024.094.0405.

[10] Swarnalatha Srinivas, Harsha K S, Sujatha A and Narendra Kumar G, “*Efficient Protection of Palms from RPW Larvae using Wireless Sensor Networks*”, International Journal of Computer Science, Vol. 10, Issue 3, No 2, May 2013 ISSN (Print): 1694-0814 | ISSN (Online): 1694-0784