

Red Palm Weevil Detector

Josephraj Kumar, A¹, Chandrika Mohan¹, Jijo Paul³, Jayalakshmi, T. ¹, Rajendran, K. ¹, Vinayaka Hegde², Kalavathi, S. ¹ and Anitha Karun²

Red Palm Weevil [*Rhynchophorus ferrugineus* (Olivier)] is one of the most devastating enemies of coconut palms. The grubs of red palm weevil attack the stem, frond or central core (cabbage) of the palm. If the grubs attack the central core, the crown finally collapses and eventually the tree perishes. Usually 1-2% of palms are lost annually due to red palm weevil attack. The attack of red palm weevil can completely destroy a productive palm in one-two month's time, considering the fact that replanting a tree and bringing that to a productive yielding phase requires years of sustained effort and substantial expenses; it therefore augurs to take adequate timely curative measures to save a tree. Though effects of the attack are fatal, if infested palms are identified at an early phase, the trees can be saved and the infestation can be completely cured. Such cured palms would return to full production potential in a couple of months.

The symptoms of infestation are not quite explicit and visible to be easily observed in the early days of pest attack. Despite best efforts through continuous observations, the symptoms of the infestation may go undetected even by an experienced farmer until a stage when it has caused significant damage to the tree and the tree becomes unrecoverable. This calls for the need of an instrument that can detect the intrusion of the red palm weevil and diagnose its presence at the early stage of entry/infestation. ICAR-Central Plantation Crops Research Institute (CPCRI) had developed an earlier version of the detector during 90's which could not pin point the sound produced by the feeding grubs from that of other spectrum of noises produced in the environment.

This project thus envisaged the development of an affordable and user-friendly gadget to enable early diagnosis of Red Palm weevil infestation fine-tuning the detection of acoustic signals. The final embedded hardware is a combination of Artificial Intelligence (AI) and Signal Processing. ICAR-Central Plantation Crops Research Institute with the collaboration of the Startup M/s Resnova, Kochi and with funding from Coconut Development Board, Kochi developed

this unique concept and the gadget for early detection of red palm weevil infestation in palms. In the feeding process by the grubs, the palm fibres are cut by the powerful mandibles resulting in the feeble sound, which is detectable by the sensor. The acoustics-sensor based detector could record the gnawing sound of the feeding grubs on palms up to 15 years old. The sensor can be fixed on the trunk about one metre from the ground level during the detection cum scanning process.



Acoustics based red palm weevil detector

The detection unit consists of a specially designed detector which is attached to the tree trunk; upon pressing the scan button the device scans the tree for two minutes. The collected signals undergo a series of filtration for removing unwanted noise signals both on the hardware and software sides. The processed signals are then evaluated by the AI models to check for patterns pertaining to grub activity. The result is then displayed on the screen of the device. The developed hardware was tested on the healthy and infested palms at ICAR-CPCRI, Regional Station Kayamkulam.

The device was able to provide an accuracy of more than 80 per cent during field trials. The device can be powered using a power bank of capacity 20,000 mAh and will work for 45 minutes in continuous operation. With further fine-tuning it would be an excellent product for early detection of red palm weevil infested palms in the field and turnaround the livelihood of coconut farmers for the successful management of the pest. It may take a year for the product to reach the farmers and the cost would be approximately ten thousand rupees. This is one of the disruptive innovative products leading towards digital India and Atmanirbhar Nariyal Krishi. ■

¹ICAR-CPCRI, Regional Station, Kayamkulam, Krishnapuram – 690 533, Kerala
²ICAR-CPCRI, Kasaragod, Kudlu – 671 124, Kerala, India, ³M/s Resnova, Kochi