



# Role of Pheromones in the Integrated Management of Coconut Red Weevil

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Red weevil (*Rhynchophorus ferrugineus*) is a very notorious pest of the coconut palm. Though it can attack palms of all ages, it prefers young palms. Since its entire life cycle is completed within the succulent inner tissues of the crown, the infestation is not detected very readily till the palm succumbs to the attack. However, if proper control measures are employed at the very early stage of the pest attack, it is possible to redeem the palms from death. This is possible only by adopting regular surveillance measures. The presence of circular holes on the stem, oozing brown thick liquid; presence of frass and cocoons in the holes and at the base of the palm; emission of foul smell; longitudinal splitting of fronds; yellowing of leaves in the midwhorl of the palms and wilting of spear; all signal the attack of red weevil.

## IPM measures

Various measures are available for regulating the pest population in the field. It has been observed that by integrating these various measures, a sizable reduction in the pest population and a significant level of control of pest attack is possible. These measures are discussed here.

### 1. Surveillance

As mentioned earlier, palms below the age of 20 years are more prone to pest attack. Such palms should be observed critically as often as possible.

### 2. Sanitation

#### 2.1 Passing of infested material

Maintenance of cleanliness in the garden is very important. All infested

palms should be dug out, split and burnt to destroy all the various stages of the pest lurking inside the crown and the trunk.

#### 2.2. Periodical cleaning of crown

Cleaning (once before and once after the rains) to expose wounds caused by the weevil is necessary. This would facilitate treating them and thus avoid further damage and new infections.

#### 3. Avoidance of injury

Care should be exercised so as not to cause injury to the bole during basin opening, ploughing or other inter-cultural operations. Cutting 'steps' on the trunk for climbing the palm should be avoided. While cutting the leaves, care should be taken to retain at least one meter of the petiole on the trunk to discourage entry of the pest into the trunk through such wounds.

#### 4. Chemical control

##### 4.1 Preventive measures

In gardens where the attack by rhinoceros beetle or bud rot is prevalent, red weevil attack can become serious. It is necessary to look for the signs of attack of black beetle such as damage to spear and also rotting caused by bud rot and leaf rot. In such gardens, cleaning the axils of the top 2-3 leaves and filling them with a mixture of sevidol and sand (25g:200g) is needed. When leaf rot is rampant, removing the damaged portions of the spear and application of a fungicide (2 ml of hexaconazole in 300 ml water or 3 g mancozeb in 300 ml water) along with the insecticide should be resorted to for treating the

crown. This process is to be repeated once before and once after the monsoon.

Whenever injuries happen on the palm trunk, they should be treated with a mixture made of carbaryl and mud.

##### 4.2 Treatment of red weevil attack

When the attack is noticed in the crown region, cleaning the crown should be followed by insecticide treatment. For this, plugging all the holes seen on the stem and crown except the topmost one should be done. Carbaryl (sevin) 1 per cent (20g carbaryl / litre of water) should be poured till it over flows from the top hole. The holes should then be plugged with clay. When the damage is noticed on the trunk, follow the same procedure as mentioned for the crown.

Alternately, systemic insecticide, monocrotophos, can be root-fed. This may be done by exposing a pencil thick root by scooping the soil around, without disturbing the root. A solution of 50 per cent monocrotophos may be prepared by mixing 10 ml of monocrotophos with 10 ml water. This is taken in a small polythene cover and positioned in such a way that the exposed root (the tip may be cut with a sharp instrument) reaches the base of the bag. The bag is secured around the root with suitable thread, and kept in position by adjusting the soil around and below the same.

This should be resorted to only after harvesting the available nuts. The next harvest can be scheduled only after a lapse of 45 days to avoid dangerous residues from being retained in the harvested produce.

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## 5. Eco-friendly measures of control

### 5.1 Coconut log trap

Catching weevils using baits prepared from coconut trunk can be practised any where. Coconut logs (1 meter long) are split length-wise and the cut surface is smeared with a mixture of toddy/pineapple juice/grape juice (100 g) mixed with 2g yeast and 2 g carbaryl. The split logs are approximated and kept in the garden. The trap is to be serviced daily to remove the weevil and to replace the bait.

### 5.2 Pheromone trap

Pheromone traps form a very important component in the IPM practices for red palm weevil.

Pheromones are chemicals exuded by the insects. These are chemical signals that aid specific functions like attracting the mates, for the aggregation of fellow insects, etc.

Now-a-days, these are being widely used as components of the IPM package developed for rhinoceros beetle and red weevil. In the year 1993, Hallet and his fellow workers isolated a pheromone from male red weevils. This has two components viz. Ferruginol (4 - Methyl - 5 - nonanol) and Ferrugenon (4 - methyl - 5 nonanon). 'Chem Tikka - International' a Costarican company manufactures and markets this and sells it in the name of 'Ferrolure'. A U.K. based firm 'Agrisens B.S.E. Ltd.' also produces two formulations of this pheromone. CPCRI has also acquired the know how for the mass production of this pheromone.

By collecting insects using these lures, one can get an idea about the population of red weevils floating around in a given locality. Similarly, this also helps to collect the floating population of insects from a locality.

A pheromone trap can be prepared using a 5 litre plastic bucket. Four

windows of 2.5 x 5 cm are cut at right angles, and at equal distances, just below the brim of the bucket. Rough gunny sacking or the extension of coconut petioles are pasted on the outside of these buckets to provide a rough surface to help the insects that come towards the trap to gain a grip on the bucket. The pheromone sachet or vial is hung from the lid of the bucket. A good bait is provided in the bucket which consists of 100-150g mashed banana (Palayankodan/Mysore variety is better) mixed with 2g yeast and 2g carbaryl. Traps thus prepared should be hung at 1-1.5 m height on coconut trees. Pheromone diffuses out at a very slow yet steady rate from the trap. Attracted by the odour of the pheromone, the red weevils, are lured towards the trap even from a long distance. While nearing the trap, the fermented smell of the poisoned food bait draws them into the bucket. By consuming the poisoned food, or by the contact of the insecticide, the insects meet their end. Female weevils are attracted more by the trap, thus exercising a direct detrimental effect on the population.

Even though pheromone trap is a very useful and effective tool for insect control, caution should be exercised while using the same to prevent disastrous effects. The following are the do's & don'ts in pheromone trap usage.

1. *Traps should not be placed in direct sunlight* as this lessens the dissipation of pheromone and the longevity of the trap.
2. *Traps should be hung only on older coconut palms* at 1.5 m height. This would help in attracting more number of insects.
3. *Do not hang traps on young palms or seedlings.* It is quite likely that all weevils that are attracted by the pheromone do not get into the trap.

If the trap is hung on young palms there is a likelihood of the weevils being attracted to the host crown.

4. *Always keep a food bait in the trap bucket.* A mixture of 100 g ripe Mysore mashed banana with 2 g yeast and 2 g carbaryl (sevin) may be added to 1 litre water and poured into the bucket for this purpose.
5. *Trap should be serviced regularly and the food bait should be replaced.* The trap should be serviced once a week to remove the stale food and dead insects. Fresh food bait should be used as replacement immediately. This is the important point. When food becomes stale and dead insects rot within the bucket, the trap may fail to lure weevils into the trap. The dead insects and rotting food, may even repel them. It is more likely that these insects would then seek other suitable hosts in the vicinity. This can lead to disastrous effects and can cause a spurt of fresh infestations in the garden.
6. *Dead insects and stale food should be disposed off properly.* While servicing the traps, it is essential that the discarded materials are buried deep. This would prevent pests and other animals/birds from eating the poison.
7. *Poison of the traps should be shifted periodically.* This would facilitate attracting a larger floating population of the weevils into the trap and thus increase its efficacy.
8. *Save the pheromone when not in use.* During heavy rains or when food replacement is not possible, pheromone sachet / vial should be removed and kept in a tightly closed container.
9. *Proper trap density to be observed.* One trap for 4-6 hectares is recommended for optimum

efficiency. Even though placing pheromone trap at closer distances may increase the catch, it is not commensurate with the expenses incurred. Placing traps at greater intervals will reduce the weevil catch far less effectively than desired.

using the pheromone trap haphazardly, farmers of a given area may use the traps in a synchronous manner to increase the effectiveness of pheromone trapping.

coconuts, by the careful exercise of the IPM package for two consecutive years, it was possible to bring down the infestation to 0.86 per cent. Palms which had to be removed due to the weevil attack were reduced from 1.77 per cent to 0.086 per cent, by the end of the experimental period. At the beginning of the experiment, the pheromone traps netted a population of 1856 weevils and this figures came down to 684 by the end of two years of experimentation.

10. *Pheromone sachets/vials to be replaced regularly.* Under Kerala conditions, one vial may last for 4-5 months. Hence, these should be replaced at regular intervals. Using pheromones for a short while and then giving a long holiday would lead to increased fresh incidences. The lingering particles of pheromone would attract the weevils to the spot and when they do not find the food bait, they would wander and infest the palms in the vicinity.

One should remember that even though pheromone trapping of insects is a very useful and effective method for insect control, this alone cannot singly bring about the desired measure of pest control. The various steps described here should be integrated, including pheromone trapping to bring about the hassle-free pest reduction in the case of red weevil. The effects will be visible when farmers of a given locality follow the measures in a co-ordinated manner to save the palms of that region. Experience gathered from the studies conducted at CPCRI fully justify the above stand.

Integrated Pest Management practices should be adopted in a federal manner through the combined effort of all the farmers in a given locality. Local administration bodies, Department of Agriculture, Research Institutions, Voluntary organizations, and above all, the farmers should jointly all contribute their effort for the success of this programme for getting an effective, visible control.

11. *Collective efforts may be followed.* Instead of each individual farmer

In an area where the pest infestation was 5.55 per cent of the

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