Termites –
Silent destroyers of coconut health

Sujithra M, Subramanian P and Rajkumar
ICAR - Central Plantation Crops Research Institute (CPCRI)
Kasaragod – 671 124, Kerala

Coconut, Cocos nucifera L., is popularly known as "Kalpavriksha" or tree of heaven mainly because every part of the tree yields benefits to the humankind. In India, it is cultivated in 2.17 million ha across 19 states and 3 Union Territories producing 21384 million nuts with an average productivity of 9815 nuts/ha (http://coconutboard.nic.in). Coconut is one of the important plantation crops in India which support millions of small and marginal farmers and can grow across diversified agro-climatic zones under both rainfed and irrigated conditions.

Over 750 insect species that attack coconut palm, termites are one such major soil insect pests. It is found in almost all the coconut growing tracts of our country. Generally termites are considered as serious pest in coconut nursery which causes 20% seedling loss in the laterite soil (Anonymous, 2006). However, they affect not only the seedlings but also the main plantations and the associated intercrops grown under coconut cropping system. Out of the 337 termite species known so far from India, about 35 species are reported to damage agricultural crops and buildings. The most dominant termite genera which attack coconut are Odontotermus which is

Termites are found in almost all the coconut growing tracts of India. Generally termites are considered as serious pest in coconut nursery which causes 20% seedling loss in the laterite soil. Termite affect not only the seedlings but also the main plantations and the associated intercrops grown under coconut cropping system

Figure 1: Termite affected coconut palms

a major mound builder followed by Coptomerus, Heterotermus, Microtermus, Microcerotermus which are subterranean habitants. Owing to changing climatic conditions, currently there is a growing concern on the termite ravage in coconut plantations in the coastal states of India.

Termites - Caste differentiation and colony division

Termites are fully social insects and they exhibit various morphological forms. They live all in colonies, with reproductives (kings, queens, and nymphs), soldiers and true workers. Termite morphological and anatomical adaptations are caste-specific, with structures evolving independently into reproductives (to allow dispersal, pair bonding and fecundity), workers (foraging and feeding, tending and feeding of immatures, nest construction) and soldiers (only defence). They live in small to larger colonies, sometimes a single colony containing a million or more individuals.

At certain times, larger colonies produce winged termites or "alates" that will eventually become king and queen termites. After a short flight where they find a suitable mate, they shed their wings and begin their family by excavating a small chamber in soft soil. They are called as primary reproductives, dark colored and the only caste with functional eyes. New king remains virtually unchanged in size whereas female expands its abdomen with increasing ovary development. A single queen can produce over 500 offsprings per year and it can stretch its abdomen by increasing body length of about 15 cm. Initially, the parental king and queen tend the young termites and often survive for a decade or longer. Once the queen's egg laying capacity increases, the older offspring begin to tend their younger siblings. Thereby colony continues to grow with increasing numbers of termites being produced each year.

However, if the king or queen dies, other individuals within the colony start developing functional reproductive organs to take their place. These individuals are called secondary reproductives. They are light in color, larger than workers but they never develop wings. Worker castes are functionally sterile and they care for the young, repair the nest, build foraging tunnels, locate food, feed and groom the other castes, and each other. Termite soldiers are the defenders of the colony and they fight against marauding ants and foreign termites with their hard mandibles. Soldiers are similar to the workers but they are blind, soft-bodied and wingless. Thus the success of termite colony establishment can be attributed to their cooperative behavior.

Scientific classification	
Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Blattodea
Infraorder	Isoptera
Super family	Blattoidea
Family	Termitidae
Genus	Odontotermus

Nature of damage

Termites pose serious threat to agriculture especially in tropical areas with higher relative humidity. Considerable crop yield losses were reported on perennial and annual crops due to termite attack in semi arid and sub - humid tropics. Their damage is greater in lateritic soils than in sandy soil. In general, termite damage is seen more in case of rain fed crops (20-25%) than the irrigated ones (10%). In rainfed crops, the plants experience moisture stress which predisposes them to termite infestations. In such cases, damage is more severe during droughts and dry season and sometimes it may exceed up to 30 - 40%.

It was observed that several tall palms in the ICAR – CPCRI research farm, Kasaragod and farmers garden were severely infested with termite attack during 2020. In severe conditions, earthern sheets were seen up to 3 - 4 feet height on the trunk of the affected palms. Deficit monsoon observed from 2015 – 2018 might have played as predisposing factors for the gradual buildup of termite infestation inside the moisture stressed coconut gardens which are now clearly visible. Termite attacks begin from the root level and then gradually spread to the upper portions. Workers and soldiers continue their activity under the earthen sheets and their damage is often negligible; occasionally it becomes serious. Although, termite does not usually kill the tree however it restricts the palm further growth due to its irreversible damage causes. However, if the damaged portion gets exposed to pathogenic microbes, palm death can also happen.

Figure 2: Earthern sheets on the Trunk

Figure 3: Runways spreading to the upper portion

Damage symptoms

A. Nursery seedlings

• Wilting is the first sign of termite attack in case of seedlings which occurs at the base of the collar region. The attacked plants show wilting before dying due to root damage which significantly affects the intake ability of water and nutrients.

• In some cases, Odontotermes spp fed directly on the roots thereby kills the plant.

B. Main field

• Earthern sheets on the trunk and runways on the bark can be seen on the grown up palms indicating that the tree had been severely infested with termites.

• In severe cases, the tissue under the bark could be completely eaten up by termites and reaching up to pith region and finally hollow stem can be noticed.

Some of the predisposing factors for termite invasion in coconut orchards are as follows: poor orchard sanitation, improper disposal of fallen leaves, nuts and debris, accumulation of crop debris (attractants for termite foragers), use of undecomposed farm yard manure, root and bark

Figure 4: Termites crawling over the fallen nut

Figure 5: Fallen nuts – source of termite attack

damage during intercultural operations and their exudates attracts termites, soil borne diseases/ nematodes invites secondary infestations of termite, finally any stress like drought or poorly drained soil etc., favours termite attack.

Integrated management practices for Termites

Termite control in coconut orchards is a herculean task and their elimination is neither advisable nor possible. Their nests are often located deep inside the ground and are difficult to reach. However, timely implementation of management practices may help us in alleviating termite problem in the perennial cropping system.

Management measures for nursery field

1. Adoption of field sanitation by disposal of organic matter in nursery soil and covering germinating nuts with a layer of river sand, drenching nursery with chlorpyriphos (0.05%) twice at 20-25 days intervals can help in avoiding termite attack.

2. Application of chlorpyrifos @ 3.8 g/nursery bed (7.5 m2) or fipronil granules @ 2.3 g/nursery bed before sowing seed nuts can also be taken up to avoid termite attack.

Management measures for main field

1. Orchard sanitation is the prerequisite action needed for preventing termite attack.

2. If the mulches around the tree basins are infested, mulches should be removed immediately.

3. Removal of crop debris and fallen nuts to reduce foods supplies to foraging termites; thereby termite attacks can be reduced.

4. Termite mounds/Termitoria in the coconut gardens should be destroyed. If possible, breeding queen should be searched out and killed to avoid occurrence of re-infestation.

5. Deep summer ploughing should be done in the coconut interspaces which expose termites to desiccation and natural predators.

6. Mechanically injured areas in the palms should be treated with copper oxy chloride @ 1% to avoid termite attack.

7. Frequent irrigation to be ensured to the palm base to reduce the termite attack especially in summer.

8. Application of calcium on the trunk can reduce the termite attack. Swabbing the base and trunk up to 2 m height with neem oil @ 5% can also reduces the termite damage.

9. Termite management primarily relies on the use of soil insecticides at the site of infestation. The most commonly used soil insecticide in India is Chloripyrifos. Affected palm tree base should be drenched with five liters of Chloripyrifos solution @ 2 ml in one litre of water. Other insecticides can be used in place of Chlorpyrifos are as follows: Imidacloprid 20% SL @ 1-2 ml litre; Fipronil 5 SC @ 4 - 5 ml/litre of water.

10. There are many ITKs adopted across regions for termite control; however their feasibility in use is locality specific and based on resources availability. Some of the ITKs followed in Kerala are: planting turmeric and arrowroot, aloevera etc in the coconut nursery may reduce termite damage. Application of crushed fenugreek and application of salt and ash in the coconut basin reduces the termite attack. Application of neem (Azadirachta indica) cake and salt in equal proportion in the basin also found to reduce termite numbers. ■