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Woolly whitefly, *Aleurothrixus floccosus* (Maskell): A Threat to Guava Orchards of India

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Invasive alien species have far-reaching ecological consequences for native ecosystems and species. Invasive insect species devastate farmed crops and woodlands, resulting in significant economic losses. Most nations, including India, have enacted strong quarantine procedures to prevent the spread of such insects. However, there are a number of factors that contribute to the travel of these invasive insects and their invasion of new places. The last several decades have been disturbing and challenging for the country's entomologists, plant protection specialists, and farmers. Several invasive species have been reported to be inflicting significant damage on Indian agriculture. In the previous two decades, at least dozens of invasive pests have been documented. The fall armyworm, *Spodoptera frugiperda*, which was found in 2018, is the most damaging, and numerous attempts have been made by many authorities to manage it.

During the same time span, three other invasive pests have been documented. Scientists from the ICAR-Central Plantation Crops Research Institute, Kasaragod, Kerala, have discovered two species of nesting whiteflies on coconut: Bondar's Nesting Whitefly (BNW), *Paraleyrodes bondari* Peracchi, and Neotropical Nesting Whitefly, *Paraleyrodes minei* Iaccarino. Unfortunately, both of these whiteflies target coconut, adding to the concern of coconut producers who are already concerned about the problem caused by the exotic rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin, which entered during 2016. Following these two reports, another invasive woolly whitefly, *Aleurothrixus floccosus* (Maskell), has just been discovered on guava in Calicut, Kerala (Sundararaj *et al*., 2020). It is native to the neotropical region. The pest may infest over 20 host plants, and it is recognised to be particularly harmful to citrus in many other nations. It was first discovered on Guava in Kerala, and it is now found in many regions of India's adjacent states. More studies should be done to prevent it from spreading to other states, as well as parasitoids and their use.

Nature of Damage

A. floccosus affects the host plant by sucking sap from the infested young leaves. High infestations can be detrimental to young plants. Indirect damage is also caused by the large amount of honeydew produced by the nymphs. Nymphs of *A. floccosus* also produce large amounts of waxy filaments which stick to the honeydew, thus forming a continuous coat on the underside of the leaves, hardly permeable to insecticides and giving some form of protection to the whitefly nymphs. Another type of indirect damage is the formation of sooty moulds on the honeydew, which impairs the photosynthetic process of the plant part affected.

Biology

Reproduction is sexual. Eggs are laid in circles or semicircles on the undersides of leaves. The female inserts its mouthparts into the leaf underside and then rotates while depositing eggs. Newly hatched crawlers move a short distance before settling to feed. There are four immature instars that are sessile. The fourth-instar 'pupa' stops feeding and undergoes metamorphosis. The winged adults are the main dispersive stage. Ants and other insects may be attracted to the colonies by the sweet honeydew excreted.

Eggs

Eggs are very small, measuring less than 0.2 mm in length. Eggs are often deposited in circles or semicircles. This makes it simpler to spot the egg stages, which are generally accompanied by a patch of waxy dust. The eggs require 4-12 days hatch, although some eggs may overwinter.

a. Damage symptoms of *A. floccosus* on guava leaves

b. Puparium

Nymphs

A. floccosus has four nymphal instars, the last of which is the pupal stage. The nymphal stages are very similar to one another and only differ in size. Nymphs exude a woolly covering of filthy-looking, flocculent white wax. The nymphs may be pale yellow or, in certain populations, brown beneath the wax coating.

Pupa

The puparium is the most important stage for identification. It is elongate in form, usually of a light-cream colour, but very rarely, black individuals can also be found. The length varies from 0.8 to 0.92 mm and the width is 0.55-0.65 mm.

Adult

Adult whiteflies are usually white, always winged, with waxy secretions on their bodies, offering few diagnostic features for identification purposes. The adults may live as long as 24 days. During warm weather condition, woolly whiteflies require about 21 days to complete its life cycle.

Control Measures

The most important contributions for controlling *A. floccosus* have been done through biological control programmes. In several Mediterranean countries where the pest was introduced, two species of hymenopteran parasitoids, *Amitus spiniferus* (Platygasteridae) and *Cales noacki* (Aphelinidae), were introduced. In the northern regions, *A. spiniferus* became well established and showed appreciable parasitic activity (Arzone and Vidano, 1983). *C. noacki* was better able to adapt itself wherever it was introduced, reaching high parasitization levels on the whitefly nymphs everywhere (Longo *et al.*, 1985).

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