



**IMAGE 1** | Sugarcane woolly aphids on the lower surface of a cane leaf, Indonesia (photo by Nader Sallam).

## The Sugarcane Woolly Aphid, *Ceratovacuna lanigera* Zehntner (Hemiptera: Aphididae)

*biosecurity feature*

There are numerous pests and diseases at our doorstep threatening the Australian sugarcane industry. Awareness is the best weapon to combat any threats. In this biosecurity feature BSES Entomologist Nader Sallam based at Gordonvale focuses on woolly aphid.

**Common name:** The sugarcane woolly aphid (Image 1).

### DISTRIBUTION

The sugarcane woolly aphid was first reported in Java (Indonesia) on sugarcane in 1897 (Zehntner 1900), and was later detected in Sri Lanka in 1905 (Kumarasinghe and Basnayake 2009). In India, the pest was first reported in 1958 in the region of West Bengal, and since then it has spread rapidly through the Indian subcontinent (Joshi and Viraktamath 2004). The pest is currently reported from Burma, Cambodia, China, Fiji, India, Indonesia, Japan, Malaysia, Nepal, Papua New Guinea, Philippines, Solomon Islands, Taiwan, Thailand and Vietnam (Lim and Pan 1978; Perez *et al.* 1980; Villacarlos and Robin 1992; Suhartawan 1996).

### HOST PLANTS

The sugarcane woolly aphid is mainly a pest of sugarcane. It has also been recorded on Johnson grass (*Sorghum halepense*) and Tear grass (*Coix lacryma-jobi*) in India (Patil *et al.* 2005) and on *Miscanthus sinensis* in Japan (Aoki *et al.* 1984).

### SYMPTOMS

Woolly aphid infestation starts beneath sugarcane leaves as a dense colony along the midrib which then extends to the entire lower leaf surface. The insects have a wax covering which increases as they mature, and the adult stage has a totally woolly appearance (Image 1). Extensive excretion of honeydew occurs and this leads to the development of sooty mould (Image 2).

### ECONOMIC IMPACT

In cases of high infestation the crop becomes stunted, resulting in reductions of up to 30% in yield and sugar contents (Galande *et al.* 2005). This aphid, along with some other aphid species, is also recorded to transmit the sugarcane yellow leaf virus (SCYLV) (Rott *et al.* 2008).

### BIOLOGY AND ECOLOGY

Laboratory studies in Taiwan demonstrated that the optimum temperature for aphid

development ranges from 20-23°C, and aphids became inactive at temperatures below 15°C and above 28°C (Cheng *et al.* 1994). Usually the pest is active during autumn and winter months, and populations decline in spring and summer. The length of the life cycle ranges from 18-31 days (Rajendran 2005). Sugarcane woolly aphid is attended by several species of ants which protect the aphids from natural enemies and feed on the honeydew they excrete.

### MANAGEMENT

#### **Chemical control**

Aerial applications of demeton-methyl and dimethoate are sometimes practiced in South East Asia. Other products such as endosulfan, phosalone and monocrotophos are used in India for the management of this pest. Alternatively, two sprays of botanical extracts of the *Acacia concinna* tree proved effective in reducing aphid populations in India (Patil and Chavan 2009).

### Host resistance

Studies in India showed that sugarcane clones with thicker phloem fibre were more resistant to aphid infestation (Aravind and Kajjidoni 2007). In China, attempts to develop transgenic varieties resistant to woolly aphid were successful. Plasmids carrying a snowdrop lectin were transferred into selected sugarcane cultivars using an *Agrobacterium*-mediated transformation, and preliminary results demonstrated a significant resistance of the transgenic plants to woolly aphid (Zhangsun *et al.* 2007).

### Cultural practices

Some cultural practices such as trash burning, removal of infested leaves, using clean seed material for planting and the removal of alternative host plants have proved effective in reducing aphid infestation.

### Natural enemies

A range of natural enemies attack this pest species. Larvae of the butterfly *Taraka hamada* (Druce) (Lepidoptera: Lycaenidae) and the moth *Dipha aphidivora* (Meyrick) (Lepidoptera: Pyralidae) (Image 3) are active predators. A number of ladybird species (Coleoptera: Coccinellidae) (Image 4) and Syrphid flies (Diptera: Syrphidae) (Image 5) also attack stages of aphids and are used in mass-release programs in Asia. Interestingly, immature aphids are known to attack the eggs and the larval stages of predaceous insects as a defence mechanism (Aoki *et al.* 1984).

### RISK OF INCURSION INTO AUSTRALIA

This pest species can be transmitted on sugarcane plant material and would quickly colonise areas of sugarcane plantations in Queensland and New South Wales. Strong

quarantine measures in Australian ports of entry will minimise the chances of this occurring. Wind dispersal is also possible but less likely.

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**IMAGE 2** | Sooty mould on cane leaves as a result of honeydew secretion by sugarcane woolly aphid, Indonesia (photo by Nader Sallam).



IN CHINA, ATTEMPTS TO DEVELOP TRANSGENIC VARIETIES RESISTANT TO WOOLLY APHIDS WERE SUCCESSFUL.



**IMAGE 3** | *Diphia aphidivora* adult moth (a) and larva (b). The larval stage is an active predator of woolly aphids.

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**IMAGE 4** | *Synonycha grandis* (Coleoptera: Coccinellidae). A ladybird beetle, where both the larval and the adult stages are predators of the aphid.

**IMAGE 5** | *Dideopsis aegrota* (Diptera: Syrphidae). A Syrphid fly, of which the larval stage feeds on the aphid.

IMMATURE APHIDS ARE KNOWN TO ATTACK THE EGGS AND THE LARVAL STAGES OF PREDACEOUS INSECTS AS A DEFENCE MECHANISM.

