Hypsipyla grandella

Introduction

The mahogany shoot borer, *Hypsipyla grandella* (Zeller) is a serious pest of tropical *Meliaceae* (Entwhistle, 1967). It restricts the establishment and cultivation of some of the more important, high-value timber including *Swietenia* spp. (mahogany), C*edrela odorata* (Spanish Cedar) and *Khaya* spp. (African Mahogany). These and other genera are attacked by shoot borers.

Identity

Authority	: Zeller (1848)
Classification	
Kingdom	: Animalia
Phylum	: Arthropod
Class	: Insecta
Order	: Lepidoptera
Family	: Pyralidae
Genus	: *Hypsipyla*
Species	: *grandella*
Synonyms	: *Hypsipyla cnabella* Dyar, (1914)
Common names	: mahogany shoot borer, cedro shoot borer, mahogany moth, barrenador de las
Role	: Pest

Signs & Symptoms

The caterpillars bore into the tops of shoots, twigs and stems of young seedlings of mahogany and cedar. Severe damage by the borer can completely destroy young seedlings (van Dinther)(Fig. 1).

Fig. 1: Caterpillar in stem (Photo credit: Manon Griffiths CSIRO Australia)

Morphology — Verma and Kaul

The adult moth of *H. grandella* is grey in color. The forewings (Fig. 2) are darker with black, crossed, zigzag lines and patches on hindwings that are whitish, and semi-hyaline with darker margins and costal zones. Male moths are smaller than females.
Males are about 13.8 mm in length with a wingspan of 26.0 mm.

Fig. 2: Wing of Adult
Hypsipyla grandella

The female is about 14.7 mm in length with a wingspan of 28.1 mm.
The eggs are oval and white measuring 0.87 mm x 0.45 mm. However, Beeson (1941) reported that the egg size was 0.9 x 0.75 mm.

There are five larval instars. All instars have many black spots in the body. On each black spot there are two light brown setae. The mean length of the first instar is 3.4 mm while the fifth is 27.1 mm.
The color varies from pale straw-brown, to pink, green or blue (Verma and Kaul). Larvae found in Trinidad are about the same measurement, greenish, with black spots.
Fifth instar larvae turn violet blue before pupation.
The pupae which are reddish-brown are of the obtect type. The pre-pupa measures about 22.63 x 3.97 mm while the pupa is 12.40 x 4.07 mm (Verma and Kaul).

Biology and Ecology

Depending on the availability of food and climatic factors the life cycle of *H. grandella* varies between 1 – 2 months. Oviposition occurs during the evening or early morning and egg eclosion occurs at night (Holsten, 1977). The female lays 1 – 7 eggs at a time in one or several plants on, or near, leaf axils, scars or veins. Oviposition may be repeated over a six day period. Usually 200 – 300 eggs are laid altogether with 1-3 eggs laid per tree.

Eggs hatch in about three days and the small newly emerged, highly mobile larvae burrow into the stem or leaf midrib. After 2 - 4 days larvae from leaves or sideshoots reemerge and move to the terminal shoot (Sliwa, 1973). The larvae cover their entrance holes with a protective web of grass or plant debris approximately three days after penetration. The larvae continue to bore into the stem feeding on the pith. There are 5 - 6 larval stages, which take about 30 days to complete. The larvae can also feed on the bark or on young leaves.

The larvae pupate in the soil or in galleries bored into the tree stem. A cocoon is spun at the upper end of the tunnel where pupation takes place. Usually the adults emerge during sunset after a pupation period of 8-10 days.

The number of generations per year depends on climatic conditions. In wet areas there several generations throughout the year and insects attack continuously as new shoots are available. In dry periods, fruits are attacked but less than in rainy periods,

Dispersal/Vectors

H. grandella is dispersed via infested nursery plants, seeds and pods taken to non infested areas. Adult shoot borers can be transported on wind currents to uninfested plants.

Management

Cultural control

Partial control of *Hypsipyla* spp. has been achieved in trials involving cultural methods. Meliaceous trees were planted with other crops / trees in mixed plantations with resistant tree species. Successful trials were conducted using the taungya agroforestry system (Newton *et al*., 1993). Factors like topography, shade, planting density and growth rate can influence attack by *Hypsipyla.* The best possible approach might be to seek resistant strains within the population of Meliaceous plants.

Biological Control

Several species of parasitoids have been released in Trinidad and the wider Caribbean in a classical biological control program (Cock, 1985). Among them *Trichogrammatoidea robusta* (Nagaraja) has become established. However, the effect on *Hypsipyla* has not been significant.

Chemical Control

The effects of pesticide on human health and the environment are well known. Nevertheless, pesticides can be used as a short-term measure of control, especially in nursery plants or as part of an overall IPM programme.

Although stems, growing points, fruit / pods and seeds are attacked by the mahogany shoot borer it is the seedling stage that is most susceptible. Young plants should be inspected for holes and the presence of larvae / pupae.

Natural Enemies

Rao and Bennett (1969) list 12 natural enemies of *H. grandella*. These include five braconids, two ichneumonids, two trichogrammids, two tachinids and a mermethid. Microbial pathogens used in the control of the shoot borer include *Bacillus* spp., *Beauvaria* sp. and *Metarhizium* sp.

Host notes

The mahogany shoot borer attacks tropical members of the family Meliaceae (FAO, 1958). Two species within this family, *Cedrela* spp. (Spanish Cedar) and *Swietenia* spp. (Mahogany), are used extensively in the neotropics for timber production. Both *H. grandella* and *H. robusta* are only associated with Meliaceae but *H. grandella* will attack any species within the family (Browne, 1968).The genera - *Khaya, Lovoa Toona, Guarea, Carapa, Entandrophragma* and *Chakrasia* are also attacked by the shoot borer.

Distribution

The two most important shoot borers are *Hypsipyla grandella* (Zeller) and *Hypsipyla robusta* (Moore). *H. grandella* occurs throughout Central America, South America (except Chile), many Caribbean islands and the southern tip of Florida (Entwhistle, 1967). Other species of *Hypsipyla* are less widely distributed in tropical America.

The mahogany shoot borer, *H. grandella,* occurs in tropical and neotropical environments where tropical members of the Meliaceae are grown.

Pest Significance and Phytosanitary Risk

The larval stages cause damage to the tree by hollowing out the softer shoots, often causing death of the shoot. Consequently, growth is reduced and branching (which is undesirable) occurs. Repeated attacks can kill the tree (Browne, 1968). Nursery plants, growing and matured plants are also attacked.

Although shoot borer attack rarely kills the tree the economic loss can be considerable. *Hypsipyla* spp. therefore is considered a major limiting factor in *Swietenia* cultivation throughout the tropics. Care should be exercised in transporting nursery plants from infested areas.

Hypsipyla spp. has a low phytosanitary risk in the region when only timbers of susceptible host plants are on the market. It could pose a risk when live infested plant material is shipped among countries, however, the use of seed material reduces the risk.

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Web Resources -

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