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THE *KHAYA IVORENSIS* BARK BORER, *COSSUS CHLORATUS*

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INTRODUCTION

Khaya ivorensis or African mahogany is one of the fast-growing tree species that has been introduced for forest plantations in Peninsular Malaysia to cater for the growing demand of the timber industry. It is categorised as a light hardwood and is used in furniture, joinery, decorative works and light construction. *Khaya ivorensis*, like other forest plantation trees, is not spared from pest attack, and one of its pests is the larva of *Cossus chloratus*, which feeds underneath the tree bark causing severe disfigurement to the tree trunk. *Cossus chloratus* is a species of moth belonging to the family Cossidae, whose larvae are stem borers. Other pests of *K. ivorensis* are the mahogany shoot borer, *Hypsipyla robusta*, which destroys the apical shoots of the tree, and the bark borers, *Prasinoxena monospila* and *Doloessa viridis*.

In Peninsular Malaysia, *C. chloratus* has been mainly observed feeding on *K. ivorensis* trees. Elsewhere, for example in Thailand, it is an important pest on longkong trees (a variety of langsat, *Lansium domesticum*), affecting the fruit quality and growth of the tree (Kritsaneepaiboon & Saiboon, 2000). Another host record of *C. chloratus* was as a bark feeder on *Parkia* sp., a legume tree in Java (Holloway 1986).

DISTRIBUTION

Cossus chloratus is distributed naturally in Peninsular Malaysia, Borneo, the Indonesian islands of Sumatra, Java and Bali, and the Philippines. In Peninsular Malaysia and Sarawak, *C. chloratus* is widespread in most *K. ivorensis* plantations.

DAMAGE

An early damage characteristic is cracked bark, followed by separation and raising of the bark within the infested area (Figure 1). The larvae bore and feed within the tunnels made underneath the layer of bark (Figure 2). Infestations are usually apparent on the main trunk but also occur at the base of limbs and on branches. As the infestation spreads along the trunk, the bark may peel and fall off easily (Figures 3a & 3b). Points of infestation appear to be random and may occur on any part of the tree trunk. The damage characteristics are similar to that caused by two other bark-boring larvae, *Prasinoxena monospila* and *Doloessa viridis*, as described by Lim (2002).

Figure 1 Infestation on the trunk is characterised by the raised bark, and wood dust mixed with frass ejected by the larva

Figure 2 Feeding tunnels underneath the bark caused by the larva of *C. chloratus*

Figure 3a Bark peeling off infested trees

Figure 3b An old wound on a trunk where the bark has peeled off

Over 95% of *K. ivorensis* trees sampled from a private plantation in Masjid Tanah (Melaka) and the Forest Research Institute Malaysia plantations in Kepong (Selangor) and Segamat (Johor) were infested with the larvae of *C. chloratus* (SP Ong, unpublished data). The trees were infested to different degrees, ranging from relatively minor (less than 25% damage) to severe (more than 75% damage).

It has been suggested by Lim (2002) that the damage caused by the bark-feeding larvae of *Prasinoxena monospila* and *Doloessa viridis* is superficial and may not affect the wood quality of infested trees, especially since the bark and therefore the damaged outer layer is removed from the timber prior to processing. The lack of any damage to the inner wood (Figure 4) invites the same conclusion for *C. chloratus*. However,

Figure 4 Cross-section of an infested part of a *K. ivorensis* tree trunk showing no physical damage to the inner wood

preliminary tests on the wood properties of 5 year-old *K. ivorensis* trees showed that there were differences in the wood strength of healthy trees and trees infested by *C. chloratus*. More samples from different sites and of different ages are needed before a general conclusion can be drawn.

LIFE CYCLE

The female moth lays her eggs in clusters in bark crevices. The larva has a robust head and strong mandibles that enable it to bore underneath the bark. The larval duration of *C. chloratus* is approximately 75 days, and during this period, it undergoes five stages called instars. The young larva is pinkish in colour and the colour gets darker as it matures (Figure 5). The feeding tunnels of the larva are often concealed beneath a layer of frass, which is held together by a web of silk (Figure 6). Pupation occurs under the bark, and the pupa is protected by a cocoon made of silk, wood dust and frass (Figure 7). The pupal duration lasts about 10 days. When the adult emerges, the exuvia is left behind and remains underneath the bark (Figure 8). The adult moth is mottled dull brown with a robust body (Figure 9).

Figure 5 The final instar of the larva of *C. chloratus*

Figure 6 A larva partially hidden in its feeding tunnel that is covered with a web of silk and frass

Figure 7 A pupa protected by a cocoon underneath the bark

Figure 8 An exuvia (cast-off outer skin) remains underneath the bark after the adult emerges

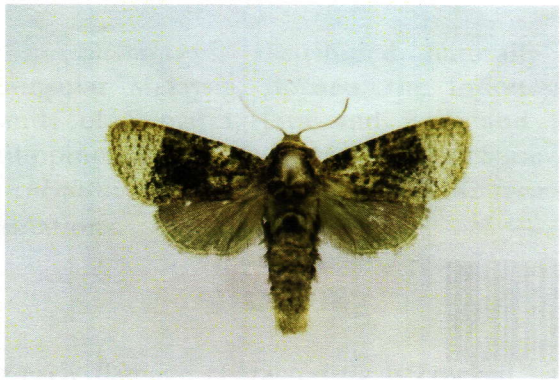

Figure 9 A preserved specimen of the adult moth, *C. chloratus* with a wingspan of 30 mm

CONTROL

There have not been any reports of losses in yield of *K. ivorensis* timber from infestations of *C. chloratus*. However, it is uncertain whether infestations of this moth cause loss of wood quality and strength at the age at which *K. ivorensis* is harvested, 20–25 years after planting. The plantations surveyed in this study were young stands. Several methods have been suggested to control *C. chloratus*. Spot treatment using chlorpyrifos was observed to be effective (Lim, 2002). Loose bark was removed and the insecticide was painted on the exposed trunk. In non-chemical trials in Thailand, neem (*Azadirachta indica*) extract and the nematode *Steinerneima carpocapsae* were effective in reducing the numbers of larvae in infested longkong plantations. In addition, the weaver ant *Oecophylla smaragdina*, a predator of many pest species including the bark-eating larvae, has the potential to be developed as a biological control agent of *C. chloratus*. Augmenting the weaver ant population on young *K. ivorensis* trees was effective in reducing mahogany shoot borer infestations (Lim, 2007). Maintaining weaver ant colonies on the trees may also be effective in reducing infestations of the bark-boring larvae.

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