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EFFECT OF MAHOGANY SHOOT BORER ON GROWTH OF WEST INDIES MAHOGANIES IN FLORIDA

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The mahogany shoot borer [*Hypsipyla grandella* (Zeller)], (Lepidoptera: Pyralidae) is a pest of tropical American meliaceous timber trees, including mahoganies (*Swietenia* spp.) and tropical-cedars (*Cedrela* spp.) Larvae of mahogany shoot borers hollow out shoots, causing them to collapse and die back. Death of the terminal shoot (leader) has been reported to result in loss of height growth, which is said to be more severe in cases in which secondary leaders are also attacked, and if trees form multiple leaders the results are poorly formed timber trees (reviewed by Lamb 1966, Grijpma 1974). *Hypsipyla robusta* Moore plays a similar role on meliaceous timber trees in tropical Africa, Asia and Australia (Beeson 1919). Of the two species, *H. grandella* is better known scientifically. Information on its impact on culture of mahoganies is available from several countries. For example, the mahogany shoot borer was considered a major pest in Puerto Rico, where plantations involving hundreds of thousands of mahoganies and tropical-cedars failed due to mahogany shoot borer attacks (Martorell 1943). However, Bauer (1987) observed relatively little damage by this insect to young Honduras mahoganies (*S. macrophylla*) and *S. mahagoni* X *S. macrophylla* hybrid mahoganies in a study conducted in Puerto Rico. In studies of mahogany shoot borer attack in different parcels of Honduras mahoganies and tropical-cedars in Peru, Yamazaki *et al.* (1990, 1992) found that 0 to 95% of the tropical - cedars and 5 to 49% of the Honduras mahoganies were attacked during one season of observations. The incidence and severity of mahogany shoot borer attack apparently varies with host plant species and other conditions.

The West Indies mahogany (*S. mahagoni*) is native to the Greater Antilles, Bahamas and southern Florida. We made observations to evaluate the effect of mahogany shoot borer damage to growth of this species in Florida.

Forty-four trees were grown in containers (repotted three times to a final container size 32 *cm* in diameter) from locally-collected seed sown in May 1988 in equal parts of sedge peat, sharp sand and cypress shavings. All mahoganies were fertilized equally with a 3N-5P-9K + microelement granular formulation about every two months, the rate increasing from 2.5 *g* / plant during the first year to 36 *g* / plant during the last season of the study. The mahoganies were held in a screen cage with 9 threads / *cm* (0.9 *mm* openings). The photosynthetically active light inside the cage was reduced 46.7% by the screen material, determined by measuring micromols $m^{-2} s^{-1}$ with a quantum sensor inside and outside the cage at noon on a clear day in June.

For about two months in the spring of 1990, 1991 and 1992, the mahoganies were exposed near mature West Indies mahoganies which were attacked by mahogany shoot borers. In June 1992 shoot borer damage was first observed in several of the young mahoganies. They were then observed frequently until 22 (50%) of them had signs of shoot borer attack, after which the affected trees and those which had not been attacked were segregated into two separate screen cages to prevent spread of the infestation. In mid-July, at which time shoot borer activity had ceased, all trees were placed in a completely randomized block in the same screen cage. On July 1 the height prior to the current year's growth and the diameter at 10 *cm* from the soil line were measured. The total height and the diameter at 10 *cm* from the soil line were measured and the number of lateral branches determined on November 25. Differences in means were analyzed by the t-test procedure (SAS Institute 1985).

The mean height of the mahogany trees prior to production of the 5th season's shoots was 92.1 *cm*. Mean height and diameter of young trees that were later attacked and those not attacked did not differ significantly. Mean increase in height during the next five months was 36.9 *cm* among the young trees that were not attacked by shoot borers and 31.4 *cm* in those attacked by shoot borers ($p > 0.22$, not statistically significant) indicating that the attacked trees compensated for loss in height growth by fast growth of a new terminal shoot. Crooks where new shoots emerged from the main stem were not conspicuous, partly because in Florida, West Indies mahoganies are apparently highly variable genetically and commonly develop rather crooked stems, thus borer-attacked trees often have crooks unrelated to borer damage. Both groups had a mean increase in diameter during the 5th (1992) season of 0.3 *cm*.

At the beginning of the 5th growing season, most of the trees had not formed lateral branches. At the end of the season, attacked trees had a mean of 5.0 (s.d. =2.6) lateral branches per tree compared to 2.9 (s.d. = 2.5) per tree in those that were not attacked ($p < 0.01$). The association between borer attack and higher numbers of lateral branches was probably due to the interruption of apical dominance. It is problematical whether the increase in branching observed in our study would affect the economic value of West Indies mahoganies grown either as ornamental or timber trees.

In southern Florida, which represents the northern edge of the range of mahogany species, mahogany shoot borer attacks peak in May and occur at reduced levels for several weeks prior to and following May (Howard 1991). Attacks are rare during the rest of the year. In contrast, at lower tropical latitudes, mahogany shoot borers may attack host trees repeatedly throughout the year, and thus are likely to cause greater economic damage (Roovers 1971, Yamazaki *et al.* 1990, 1992).

In summary, in Florida, mahogany shoot borers attacked West Indies mahoganies at the beginning of their 5th growing season, at which time they were approaching 1 *m* in height. By the end of the growing season, height growth of a new leader had compensated for the loss of the primary leader. Interruption of apical dominance resulted in increased lateral branching.

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VARIATION IN SPECIFIC GRAVITY OF FIVE-YEAR-OLD *ACACIA MANGIUM* FROM THE BATU ARANG PLANTATION, SELANGOR, MALAYSIA

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Acacia mangium, when established in plantations, grows as fast or faster than other plantation species such as *Gmelina arborea* and *Eucalyptus deglupta* (Anonymous 1983). The trees can reach 30 *m* in height, with trunk diameter of 40 *cm* at breast height (1.3 *m*) in 14 years. In Peninsular Malaysia, *Acacia mangium* has been planted since 1982 as part of the Compensatory Forest Plantation Project.

Four 5-*y*-old *Acacia mangium* trees were obtained from the Batu Arang plantation in Selangor, during a thinning operation carried out by the Forestry Department, Peninsular Malaysia. From each tree, discs of about 5 *cm* in thickness were obtained at about 10, 30, 50, 70 and 90% heights of the clear bole, measured from the base.