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First Report of *Apate monachus* (Coleoptera: Bostrychidae) in Big-leaf Mahogany (*Swietenia macrophylla* King) Plantations in India

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Abstract

Swietenia macrophylla King (big-leaf mahogany) is one of the fast-growing, highly priced tropical timbers in the world. As dwindling of its population and ban on felling in its native countries, big-leaf mahogany is being widely cultivated in South East countries including India to meet growing international market demand. So far, it is reported that shoot borer is only serious pest in mahogany species. First time, the sever damage caused by heart-wood borer was found in the young big-leaf mahogany plantation in Anaikatty, Coimbatore, Tamil Nadu (India) in month of April, 2016. Hence, the present was undertaken to identify pest and its damage on wood. From the study it was identified with help of specimen that the damaging adult beetle was *Apate monachus* (Family: Bostrychidae), commonly known as the shot-hole-borer. The damage was characterized by a hole in the trunk, from where the shot-hole-borer enters constructing tunnels, and producing lot of saw dust while feeding the wood. This is the first record of *A. monachus* attacking mahogany trees in India

Keywords: Insect, shot-hole-borer, *Swietenia macrophylla*, mahogany, forest, borer

1. Introduction

Swietenia macrophylla King (Big-leaf mahogany) native to Mexico, Central and Northern South America is one of the world's highly prized timber species belonging to meliaceae family. The genus, *Swietenia* has three mahogany species namely *Swietenia mahagoni*, *S. macrophylla* and *S. humilis*. Of these, the first two species are timber species and *S. macrophylla* is being widely cultivated as plantation since its fast growing in nature. Mahogany is suitable for large-scale timber production, because of its excellent timber quality, reddish color wood, workability and its high durability. Wood can be used for construction materials, plywood, high-grade furniture and cabinet making. It is also suitable for paneling, framing, flooring, automobile bodies, interior trim of boats, radio and phonograph cabinets, bodies of musical instruments, moldings' and other ornaments. Mahogany is still widely preferred timber for fine furniture in UK and USA. Though economic rotation for mahogany plantations is defined to be around 30-50 years, it is being harvested in around 15-20 years in private farms in the Philippines. Besides timber use, the mahogany has many therapeutic values. Because of its high economic values and the demand for timber, mahogany has been over-exploited in its native countries. As results of this, mahogany population dwindling down and its felling is banned in its native and it is listed in CITES appendix II for conservation ^[1, 2]. In India, mahogany was introduced in the Botanical Garden, Kolkata in 1795 as ornamental tree. It is being cultivated as timber species in Kerala, Tamil Nadu, Karnataka, Maharashtra and West Bengal. The Kerala State has a largest area under mahogany plantations in India. Mahogany can tolerate a wide range of soils and environmental conditions. Mahogany grows well on alluvial soils, volcanic soils, heavy clays, lateritic soils and limestone soil at elevations of 0 – 1500m above sea level with a mean annual temperature of 20 – 28 °C. Due to its huge demand and fast growing nature, it is gaining popularity recently among the farmers besides the forest departments and being raised in plantations at different parts of Tamil Nadu and Kerala.

The establishment of mahogany plantation can be limited by the incidence of pests at all stages of their development, which inflict serious damage in mahogany plantations. The seedlings shoot borer, *Hypsipyla robusta* which attacks can reach epidemic proportions, resulting in poor bole form and a severe reduction in timber quality. It was reported that mahogany web worm,

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Macalla thyrsoalis causes defoliation and webbing in young plants. Mahogany shoot borer *Hypsipyla grandella* bores into the buds, shoots and stems of the tree [3].

The Bostrichidae are primarily a family of wood beetles that live on decaying or dead trees. A few species are known to be harmful to stored products [3], and some are considered important pests of wooden artwork and ancient structures, especially in tropical countries [4], in addition, some species are able to attack living plants. The damage caused by *A. monachus* adults in vegetated trees results from tunneling in the trunk and branches before the adult breeding [3]. The adult feeds on the trunk and branches of young and healthy trees [5, 6], but prefers for oviposition dead wood on branches or in dry, wilting trees, where there are optimal conditions for larval growth [5, 7, 8]. This communication aims to record and describe the occurrence of coffee tree borer (*A. monachus*) in mahogany plantation in India.

2. Material and methods

In the month of April, 2016, Mr. Mohan, a tree growing farmer from Attapady (Coimbatore district), Tamil Nadu was accidentally noticed a lot of holes on trunk of young mahogany trees and found unusual form of growth pattern viz. a die-back of terminal shoots, heavy coppicing at base of tree and gummosis. The big-leaf mahogany plantation is established in 3-acre dry land in Anaikatty hills in 2013 with 3 x 3m spacing, which is located at midst of hills. The authors were visited the farmer's mahogany plantation on 21st April, 2016 and made detailed investigations by dissecting the infected trees in the field.

3. Results and Discussion

The area of occurrence had 3-acre planted with *S. macrophylla*, aged three years, with spacing of 3x 3m, totaling 1,350 trees at Anaikatty (11°6'17.4''N; 76°46'5.8''E; Elevation – about 700m). Pest incidence was found during the month of 3rd week of April, 2016. Mean girth at breast height and height of trees were 47cm and 9.5m, respectively. Five infected trees were randomly felled, if sawdust resulting from the *A. monachus* activity was found and adults of *A. monachus* were collected from the dissected trees. The borer infestation was found on western side of the plantation and its attack proceeded from west to east direction without leaving any trees. It was found that a lot of holes on trunk and galleries at base of infected trees. Further, noticed that the leaves were small and leathery, shiny and tips dried. The main trunk had many tunnels, which joined together later and

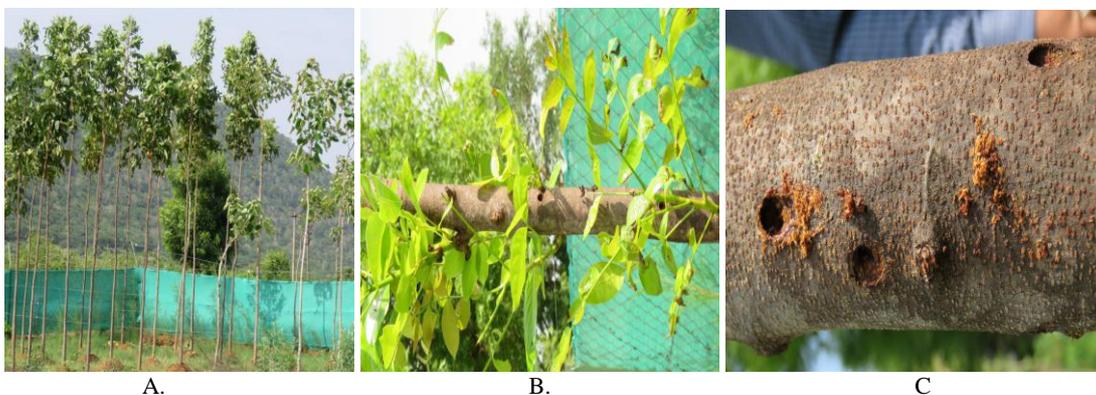
looks hollow pipe (Fig 1a-e).

Adults of *A. monachus* are brownish black in colour and long and cylindrical in form. The body length of the adult beetle varied from 1.03 to 1.49 cm, with an average of 1.30 ± 0.04 cm ($n = 10$). The fore head was covered with long bristles joined to form a brush. A convex prothorax was endowed with a spinule that was prominent in the anterior margin and that became larger towards the head (Fig 1h & i). The spinule was more prominent whereas the elytra were linearly punctuated along the convex surface of the abdomen. The ventral view of the abdomen was reddish in colour and pubescent. These observations were corroborated by the description of the species by earlier workers [9].

In general, *A. monachus* quickly caused apparent damage during the month of April- May. Adult beetles could easily be detected by presence of holes on stem and sawdust at the bottom of the trees (Fig. 1d). The number of penetration holes was higher in mahogany trees (12-15 holes per tree). Although the opening hole had a well-defined diameter, the lumen was very different, with galleries often linked, allowing the insect to move freely through the plant (Fig. 1b). The infected mahogany trees tended to crack under wind action if they contained tunnels created by the beetles (Fig.1c). It was found that the adults were involved in making holes and formation of tunnels and galleries. The tunnels were affected by the overall diameter of the branches or trunks of the trees, with tunnels varying from 25 to 60cm in length. Regardless of the number of entry holes, galleries formed by adults were all connected to each other [10].

In big-leaf mahogany, the tunnels were shorter and, in some holes in these trees, the sap leakage was observed, which gradually solidified, forming lumps (Fig. 1d). It was noticed that adults were actively penetrate the plants during the early morning. The presence of the beetles in April- May is probably connected with the presence of favorable climatic conditions of the area where the plantation was established (i.e. arid climate). As mahogany is being cultivated widely both as plantation and ornamental tree, it becomes important to determine which biotic factors contributed to this *A. monachus* infestation [10].

Preventive and curative interventions are fundamental for the control of this pest. Prevention requires a thorough inspection of the young tree before transplanting to detect the presence of beetle penetration holes. Careful monitoring must be done, particularly during summer season, when the high temperature favours attacks by *A. monachus*. More



A.

B.

C.

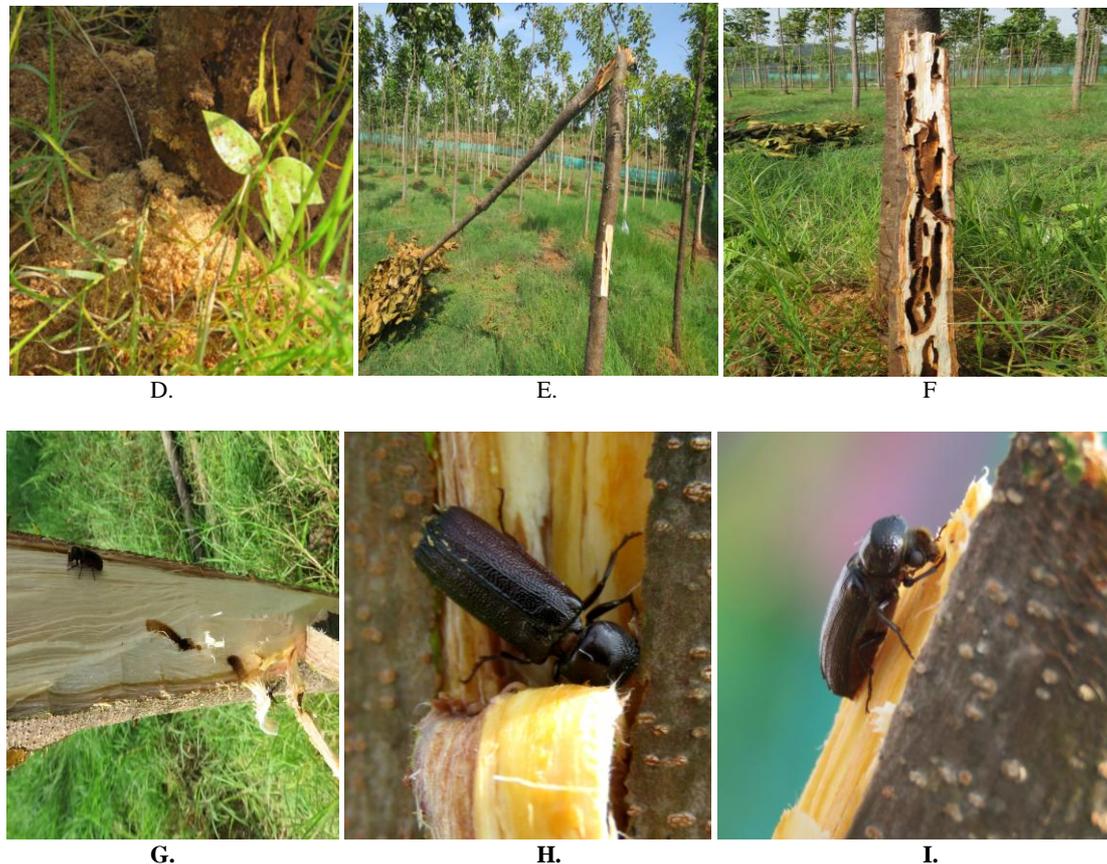


Fig 1: *Apatе monachus* beetles on big-leaf mahogany trees in the study area

(a) *A. monachus* infested big-leaf mahogany plantations (b) Infected tree have profuse coppice growth on the stem (c) Holes of adult *A. monachus* (d) Saw dust at base of tree produced by adult *A. monachus* beetles (e) Wind thrown infected mahogany tree (f) Deep inter-connected tunnels were produced by *A. monachus* adults on mahogany trees (g) Emerging adult beetle from hole while dissecting tree in the field (h, i) Adult beetles were long and cylindrical, and brownish-black in colour.

The chemical control measures must be done in the months when the adults are present, and it involves spraying the woody parts of the plants with long-lasting insecticide [10, 11]. Only incases of sporadic infestations by *A. monachus* is it possible to use the physical technique of inserting a flexible metal wire into the tunnels to kill adult insects. In case of biological control, use of the fungi *Metarhizium anisopliae* or *Beauveria bassiana* may help to control the sporadic infestations [10, 11]. It was reported that among the natural enemies of *A. monachus*, *Sclerodermus* spp. and other braconid species closely related to the genus *Glyptocolastes* (*Glyptodoryctes*) are parasites of this beetle [12].

4. Conclusion

The present study finds and confirms that *A. monachus* is a potential and harmful insect pest of mahogany and other members of meliaceae. Preventive and curative interventions are fundamental for the control of this pest. Mechanical control measures may be adapted to control this pest when the pest infestations are sporadic. Natural enemy, *Sclerodermus* species and other braconid species (*Glyptodoryctes*) may be also helpful to control this pest. Therefore, the information provided here could be used to locate this significant pest and help tackle it in nurseries and plantations.

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