Apate monachus (Fabricius, 1775), a Bostrichid Pest of Pomegranate and Carob Trees in Nurseries – Short Communication

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Abstract

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The attacks of adult *Apate monachus* (Fabricius) on pomegranate (*Punica granatum* L.) and carob (*Ceratonia siliqua* L.) trees in a plant nursery in southern Italy was described. The adult beetles produce circular holes and large sinuous tunnels on young trees that can involve the trunk and branches. The same plant can be affected by large numbers of such access holes. The adults appear during late June and reach a peak during the first three weeks of July. Given the increase in the spread of cultivation of these trees and, therefore, in the rate of spread of this pest species, further damage to crops is expected.

Key words: Bostrichidae; *Apate* spp; *Punica granatum* L.; carob; black borer

The black borer (BB) *Apate monachus* is a bostrichid beetle harmful to ornamental and fruit trees and other woody plants. The species has long been known for attacks on grapevine, peach, apple, pear, avocado, ornamental and fruit trees (Prota 1963; Zanardi *et al*. 1969; Luciano 1982; Wysoki *et al*. 2002; Tzanakakis 2003) and, recently, it was reported to damage lemon plants (Di Franco & Benfatto 2008). *Apate monachus* is widespread in large parts of southern tropical areas; in addition, in Tunisia, it is also known to be harmful to palms (Sadok & Gerini 1988). In areas where *A. monachus* occurs in West Africa, it causes problems in forest management and in wood-processing factories (Atuahene 1976; Becker 1980); in addition, in Tanzania it is a pest of coffee crops (Kilambo *et al* 2005).

In June 2010, young carob (*Ceratonia siliqua* L., Fam. *Fabaceae*) and pomegranate (*Punica granatum* L., Fam. *Punicaceae*) plants in a plant nursery were found to be infested with adult *A. monachus*. This finding confirms the number of plants species on which *A. monachus* is a pest, and its diffusion in the Mediterranean area (Avidoz & Harpaz 1969; Halperin & Damoiseau 1980).

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 (Liu *et al*. 2008) and some are considered important pests of wooden artwork and ancient structures, especially in tropical countries (Hickin 1975); in addition, some species are able to attack living plants (Liu *et al*. 2008). The damage caused by *A. monachus* adults in vegetated trees results from tunnelling in the trunk and branches before the adult breeding (so-called 'maturation feeding'; see Liu *et al*. 2008). The adult feeds on the trunk and branches of young and healthy trees (Browne 1968; Luciano 1982) but prefers for oviposition dead wood on branches or in dry, wilting trees, where there are optimal conditions for larval

growth (Peretz & Cohen 1961; Browne 1968; Zanardi *et al*. 1969). Variation in the life cycle of *A. monachus* occurs in the development time of the larval stadium, which can take from 32 months to 36 months (Zanardi *et al.* 1969); however, under more favourable conditions, it can be reduced to 55–114 days (Rodriguez Perez 1981).

Adults of *A. monachus* were found in a plant nursery in southern Italy in the Ionian Calabrian coastal area of Saline Joniche (RC) (37°56'N and 15°43'E). Citrus, palm, pomegranate, carob, walnut, and chestnut are the major species grown in the nursery. The plants are regularly arranged in relation to height and size, with the number of plants in each row varying from 20 to 40. The infested pomegranate trees were of two sizes (2.20 m or less than 1.50 m), the carob trees were on average approximately 2 m high. The plants were monitored weekly from June to the third week of July. If sawdust resulting from the *A. monachus* activity was found in the plant pots, the plants were carefully opened to find adult beetles which were then removed and observed.

Adults of *A. monachus* were long and cylindrical in form and brownish-black in colour (Figure 1a). The body length of the adult beetle varied from 1.01 cm to 1.54 cm, with an average of 1.32 ± 0.04 cm (n = 15).

The forehead of the adult 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. The spinule was more prominent in the males. The elytra were linearly punctuated along the convex surface of the abdomen. The ventral view of the abdomen was pubescent and of a reddish colour. These observations were corroborated by the description of the species by Walker (2008).

Damage caused by *A. monachus* quickly became apparent during the last 10 days of June. During monitoring, adult beetles could easily be detected by holes in the trees and from the resulting sawdust. Adults continued to be found until the middle of July, although at a lower frequency. The highest percentage of attacks occurred on pomegranate trees and 100% of plants in the nursery were attacked; fewer carob plants in total were attacked. The number of penetration holes was higher in pomegranate plants (maximally 12 holes per tree) than on carob trees, where the maximum number of holes found was six. 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 (Figure 1b). Only in one nut tree was a hole detected that was not followed by the formation of a tunnel. No other tree species growing in the nursery was infested.

In relation to the age of the pomegranate plant, trees tended to crack under wind action if they contained tunnels created by the beetles (Figure 1c). The adults were simultaneously involved in the formation of tunnels; and were easy to be found in the galleries (a maximum of six adults were found in a single pomegranate tree). The tunnels, especially in the pomegranate, were affected by the overall diameter of the branches or trunks of the trees, with tunnels varying from 20 cm to 40 cm in length. Regardless of the number of entry holes, galleries formed by adults were all connected to each other. Some females found inside the branches during the last week of monitoring were ready to oviposition, which occurred quickly once the females were transferred to the laboratory.

In the carob plants, the tunnels were shorter and, in some holes in these trees, the sap leakage was observed, which gradually solidified, forming lumps (Figure 1d). Adults were seen to actively penetrate the plants during the early morning (Figure 1e).

The presence of the beetles in June, earlier than reported by Zanardi (1969), is probably connected with the climatic conditions of the area where the plant nursery is situated (i.e. a semiarid climate). Pomegranate and carob species now occur widely in different areas, both as cultivated and ornamental plants; therefore, it becomes important to determine which biotic factors contributed to this *A. monachus* infestation. In Turkey, *A. monachus* is also found on pomegranate, causing damage to the branches similar to that seen elsewhere (Özturk & Ulusoy 2006; Öztop *et al*. 2010).

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 the first weeks of summer, when the high temperature favours attacks by *A. monachus*.

More difficult is the monitoring of larval populations which seem to be found more prevalently in dead or decayed wood (Zanardi *et al*. 1969). With reference to the chemical control of adults, it 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. Only in cases of sporadic infestations by *A. monachus* is it possible to use the physical technique of inserting

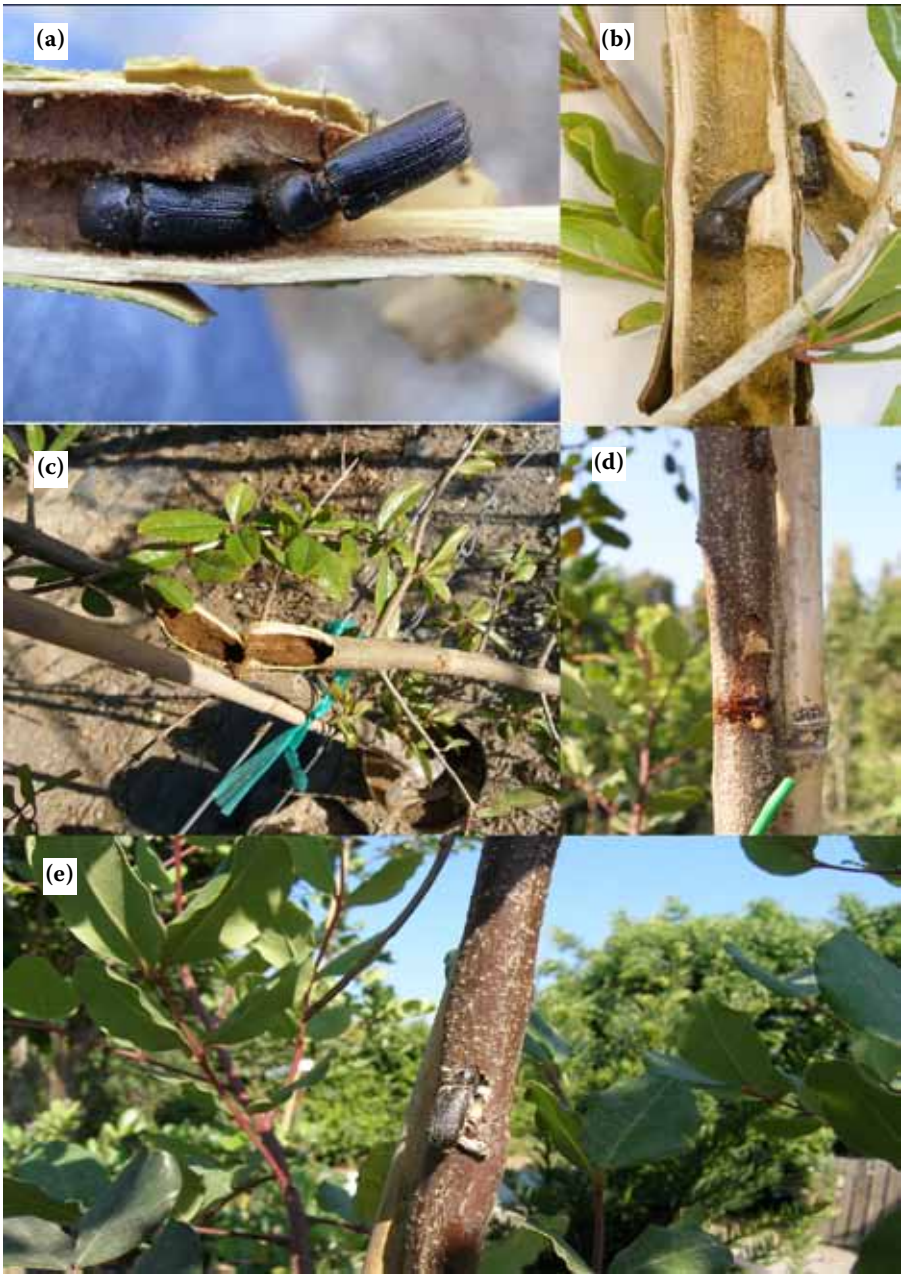

Figure 1. *Apate monachus* beetles on pomegranate and carob trees in the study area: (a) the adult beetles were long and cylindrical, and brownish-black in colour; (b) deep tunnels were produced by *A. monachus* adults on pomegranate trees; (c) the pomegranate trees containing such tunnels tended to crack in windy conditions; (d) sap leaking from a hole produced by *A. monachus* on a carob tree and beginning to solidify; (e) an *A. monachus* adult in the active phase of penetrating the carob tree

a flexible metal wire into the tunnels to kill adult insects. Biological control is desirable but currently there is not a means of control generally adopted. It might become desirable to move towards biocontrol methods already used against other coleopterans, such as those involving the use of the fungi *Metarhizium anisopliae* or *Beauveria bassiana* (Liu & Bauer 2006). In this case, the complexity of the pest control is also associated with the possibility of preventing emerging adults from flying to new areas, such as plant nurseries or stands of young trees. Rodriguez-Perez (1975) 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.

The present paper finds and confirms that *A. monachus* is a potential and harmful insect pest of pomegranate and carob plants. Therefore, the information provided here could be used to locate this significant pest and help tackle it in nurseries growing these tree species.

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