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Original Article

The infestation by an exotic ambrosia beetle, *Euplatypus parallelus* (F.) (Coleoptera: Curculionidae: Platypodinae) of Angsana trees (*Pterocarpus indicus* Willd.) in southern Thailand

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Abstract

An exotic ambrosia beetle, *Euplatypus parallelus* (F.) was collected from infested *Pterocarpus indicus* Willd. trees in Prince of Songkla University. Larvae and eggs were found in simple galleries with a single branch. Either a single male or a male and a female were found in each gallery. Half of these infested trees were previously attacked by long-horned beetles probably *Aristobia horridula* (Hope) (Coleoptera: Cerambycidae), while some of them appeared to be healthy. *Fusarium oxysporum* Schlecht.:Fr. was isolated from frass, sapwood samples and insect larvae, and might be a cause of death of *P. indicus*.

Keywords: ambrosia beetle, ambrosia fungus, Angsana tree, Platypodinae, Euplatypus, Thailand

1. Introduction

Ambrosia beetles are wood-boring insects that live in symbiosis with fungi. They occur in two subfamilies (Scolytinae and Platypodinae) of the very large family of weevils (Curculionidae). They are abundant in the tropics, and responsible for severe economic damage to timber and the wood industry. As a result of the transport of infested timber between countries, some of these beetles are becoming widespread in tropical and subtropical regions. One such species is *Euplatypus parallelus* (F.)(Platypodinae) which is native to tropical America, but has been introduced to Africa (where it is widespread), Madagascar, Australia and South-east Asia (Wood & Bright, 1992; Beaver, 1999)

Pterocarpus indicus Willd. is a native tree to South-east Asia distributed from southern Myanmar to the Philippines (Carandang, 2007), but native populations have apparently never been found in Thailand. This tree is commonly planted in large numbers as ornamental or shade trees along roads, walkways, in parks and residential areas in the tropics. It is fast growing, evergreen, has an attractive canopy shape, and has a typically synchronised short flowering period. In Prince of Songkla University, this tree has been usually grown in a row or as a group of a few individuals since the establishment of the university in 1967. In the last few years, a number of large trees (up to 20) of this species have suddenly died, with all the crown leaves dying. Half of them were previously infested by long-horned beetles, probably

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Aristobia horridula (Hope), which is an important pest of *Pterocarpus macrocarpus* in Thailand, and is known to attack *P. indicus* (FAO, 2007). Adults of this species were found at the base of several trees. However, some of the trees were presumably healthy since no disturbance or long-horned beetle attack was recognised. There is no previous information on attacks by *E. parallelus* in Thailand, and the objective of the present study is to report the presence of infestation by *E. parallelus* on *P. indicus* in southern Thailand and to isolate fungi associated with the insect *E. parallelus* in relation to *P. indicus* disease.

2. Materials and Methods

2.1 Study site

Prince of Songkla University (07° 00.4' N, 100° 30.7' E., 262 ha) is situated in the outskirts of Hat Yai City (ca. 150,000 inhabitants), Songkhla Province. It is at the base of the 7km-long Kho Hong Hill which is dominated by secondary forest and rubber plantations. Around two-thirds of the university area is covered by university buildings and student accommodation. Since its establishment in 1967, both native and exotic species have been planted in the former rubber plantations. The most common plant species include *Jacaranda obtusifolia* Humb. & Bonpl., *Lagerstroemia* spp., *Fagraea fragrans* Roxb., *Acacia auriculiformis* Cunn., *Shorea* spp., and *P. indicus*. The university also owns the large tract of secondary forest (60 ha) in abandoned rubber plantations and part of Kho Hong Hill. This area is protected by the university. Trees of the families Myrtaceae, Theaceae, Clusiaceae, Fagaceae, and Rubiaceae, such as *Schima wallichii* Choisy, *Castanopsis schefferiana* Hance, *Memecylon edule* Roxb., *Diospyros frutescens* Blume, and *Diplospora malaccensis* Hook.f. were the most common (Bumrungsri *et al.*, 2005). The climate is hot (average 28.3°C over 10 years) and relatively humid (average relative humidity of 72%) with 2,118 mm mean annual rainfall. Rainfall is heavy in October-December (Kho-Hong Meteorological Station, 2004). The climate is classified as tropical wet seasonal.

2.2 Method

Recently dead/partly dead *P. indicus* and a nearby living tree were investigated for the particular signs of disease and/or infestation by insects. Two major branches of one tree attacked by insects were cut with a chainsaw horizontally and vertically into pieces, and voucher specimens of insects (adult and larvae) were collected. Some pieces of wood were transferred to the Department of Biology for further investigation and to the Department of Microbiology for fungal isolation. Chisel and hammer were used to determine the shape of the galleries, and the population structure of the wood borer. Voucher specimens were identified by RAB.

Small pieces of wood cutting from the sapwood containing insect galleries, insect larvae, adult insect, frass, and wood resin were collected for fungal isolation. Each sample was placed on cornmeal agar (supplemented with 50 mg/l of tetracycline and ampicillin to suppress bacterial growth) and incubated at 25°C until the outgrowth of fungi was discerned. Hyphal tips originating from the samples were transferred to potato dextrose agar (PDA) without antibiotics. Each fungal isolate was checked for purity and transferred to the new medium by the hyphal tip method. Fungi were identified on the basis of their morphology (Barnett and Hunter, 1998; Samson *et al*., 2004).

3. Results

A number of small holes (1 mm in diameter) and cylinders of frass (2-3 cm long) were observed on one side of two major branches and trunk, 1.5 m to ca. 6 m from ground , of the living tree (DHB 48 cm, 18 m high) adjacent to two dead *P. indicus* (DBH 70 and 90 cm, respectively) in late June 2007 (Figure 1 and 2). A week later, leaves on one major branch of that living tree were found to have suddenly died, but were still attached to the tree. Reinvestigation confirmed that this frass was also found in several previously dead large *P. indicus* found in the university. Most insects collected from gallery systems in the wood were identified as *Euplatypus parallelus*. A few individuals of *Cryphalus* sp. (Coleoptera: Scolytidae) were also collected. Twenty galleries were examined. These galleries extended through the bark into the sapwood (diameter of branches examined were

Figure 1. Fine dust of frass at the base of the infested tree.

Figure 2. Cylinders of frass at the opening of holes made by this beetle

22-26 cm). Some galleries went further to the opposite side of the sapwood. Most of the sapwood had rotted and smelled like fermented wood, while some was still alive. Gallery walls were dark-stained with fungal mycelia. The gallery was simple, although not particularly straight, 1 mm in diameter, with a single branch. Galleries in examined disks varied in length, 39-45 mm in some disks, 88-100 mm in others, probably indicating the duration of infestation in each part of the branch. Single males were usually found in the shorter galleries (n=9), while female and male and/or larvae (Figure 3 and 4) were found in longer galleries. Up to twelve larvae (range 1-12) of different sizes were found in each gallery, whilst some galleries apparently had no adult, either because the gallery had been abandoned, or because the adults were lost during the cutting and extraction processes. Larvae of *E. parallelus* are creamy white and curved. A cluster of eggs (4 -8) was also found either with and without larvae in some galleries. Adults, when present together with larvae, were found in the initial part of the galleries, while larvae were close to the further end of the galleries.

A total of 46 fungal isolates were obtained, 25 from 4 samples of frass; 8 from a sapwood sample; 5 from wood resin and insect larvae and only 3 isolates from adult insects. *Fusarium* spp. including *F. oxysporum* Schlecht.:Fr. and *F. solani* (Mart.) Sacc. were the dominant sporulating fungi. *Trichoderma* sp., Mucorales and non-sporulating fungi were also isolated from the tested samples.

4. Discussion

The occurrence of this exotic insect in Thailand is not surprising. *E. parallelus* is one of the platypodine curculionids that has become pantropical (Wood & Bright, 1992; Beaver 1999; Jordal *et al.*, 2001), probably as a result of the timber trade. It was first recorded in Thailand in Ranong province by Murphy and Meepol (1990), as its synonym *Platypus linearis* Stephens, and probably arrived in Thailand during the 1970's since there is no record in the literature before that time (Beaver and Browne, 1975). It has been listed in a checklist of insects and mites in Thailand (Department of National Parks, Wildlife and Plant Conservation, 2007), and is now widespread and common in all regions of Thailand (R.A. Beaver, unpublished information).

Figure 3. Adult, larvae and egg of *E. parallelus* in galleries. Gallery wall is dark stained.

Figure 4. A male *E. parallelus* found in galleries.

Euplatypus parallelus is strongly polyphagous. Schedl (1965) lists 65 host tree species in 21 families of plants in the Afrotropical region, and many others have been recorded in other parts of its range. They include both broad-leaved and coniferous trees (Zanuncio *et al.* 2002; 2005). In Songhkla, it has also been found infesting recently sawed rubber wood *(Hevea brasiliensis* (Willd,ex A. Juss) Müll. Arg) (W. Sittichaya per. observation). This species has previously been recorded as a host tree by Schedl (1965) in Africa, and Browne (1980) in Malaysia, but the record from *Pterocarpus indicus* appears to be new. Since larvae of this beetle feed on an ambrosia fungus, and ambrosia fungi seem to be nonspecific to particular plant species, polyphagy should be expected. Most of the ambrosia fungi belong to four mitosporic genera, *Ambrosiella*, *Raffaelea*, *Monacrosporium* and *Phialophoropsis*. However, more genera have been reported to be involved with ambrosia beetles including *Fusarium*, *Acremonium*, *Candida* and *Graphium* (Baker and Norris, 1968; Batra, 1963; 1967). We were able to isolate several fungi from sapwood, frass, wood resin, insect larvae and adult insect. Particular attention was paid to *Fusarium* spp. as plant pathogenic fungi. *F. oxysporum* and *F. solani* were isolated from all samples except the adult insect. It is confirmed that *F. oxysporum* caused death of *P. indicus* in Malaysia due to wilt disease (Philip, 1999). The dying *P. indicus* infested by *E. parallelus* in this study showed wilt symptom. *F. oxysporum* may be introduced into the tunnels by beetles and may be the possible cause of death of *P. indicus* in the south of Thailand.

The presence of a single male in a short gallery indicates that it is the pioneer sex (Zanuncio, 2005), and that it had not yet succeeded in attracting a female. Field observations on a recently cut branch indicated that only males (n= 6) were attacking.

It has been suggested that most Platypodinae are secondary pests in nature, since they attack stressed plants (Zanuncio, 2002; 2005). In our case, many trees have signs of previous attack by long-horned beetles (Coleoptera: Cerambycidae), or other obvious disturbances (e.g. root disturbance from car park construction). However, some healthy-looking trees were also damaged by this beetle, especially when several of a group of trees were infested. This probably happened when a large population from nearby infested trees was present and mass attack by this beetle occurred since male platypodine beetles are able to release

a pheromone which attracts other males and females (e.g. Renwick *et al.,* 1977; Milligan *et al.,* 1988; Tokoro *et al.*, 2007).

Although the economic damage from the attacks of this beetle on *P. indicus* is not considerable, the tree is of social and ecological value especially in urbanized areas. This tree is one amongst the most common planted trees for shading and ornamental purposes because it grows well in an urban environment. Thus large scale infestations can strongly affect the healthy of urban environments. To prevent such infestation, the removal of attacked trees, the control and prevention of the attacks of long-horned beetles, and the maintenance of the vigorous growth of this tree are recommended.

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References

Baker, J.M. and Norris, D.M. 1968. A complex of fungi mutualistically involved in the nutrition of the ambrosia beetle *Xyloborus ferrigineus*. Journal of Invertebrate Pathology 11, 246-250.

Barnett, H.L. and Hunter, B.B. 1998. Illustrated genera of imperfect fungi. Prentice-Hall, Inc. The American Phytopathological Society. USA.

Batra, L.R. 1963. Ecology of ambrosia fungi and their dissemination by beetles. Transactions of the Kansas Academy of Science 66, 213-236.

Batra, L.R. 1967. Ambrosia fungi: a taxonomic revision, and nutritional studies of some species. Mycologia 59, 976-1017.

Beaver, R. A. and Browne, F. G. 1975. The Scolytidae and Platypodidae (Coleoptera) of Thailand. A checklist with biological and zoogeographical notes. Oriental Insects 9, 283-311.

Beaver, R. A. 1999. New records of ambrosia beetles from Thailand (Coleoptera: Platypodidae). Serangga 4, 29-34.

Browne, F. G. 1980. Bark beetles and ambrosia beetles (Coleoptera, Scolytidae and Platypodidae) intercepted at Japanese ports, with descriptions of new species. II. Kontyu, 48: 380-389.

Bumrungsri, S., Sripao-raya, E. and Leelatiwong, C. 2006. A quantitative analysis of plant community structure in an abandoned rubber plantations on Kho-Hong Hill, southern Thailand. Songklanakharind Journal of Science and Technology 28, 479-491.

Carandang, W. M. 2007. *Pterocarpus indicus* Willd. Asia Pacific Forest Genetic Resource Programme. www.apforgen.org [August 20, 07].

Department of National Parks, Wildlife and Plant Conservation. 2007. Checklist of insects and mites in Thailand. http://www.dnp.go.th/foremic/Entomology/insect_1.htm [August 22, 07].

Food and Agriculture Organisation, Forestry Department. 2007. Overview of forest pests, Thailand. Forest Health and Biosecurity Working Papers, FBS/32E, 47 pp. www.fao.org/forestry/webview/media?mediaId=12303&langId=1 [September 18, 2007]

Jordal, B. H., Beaver, R. A. and Kirkendall, L. R. 2001. Breaking taboos in the tropics: incest promotes colonization by wood-boring beetles. Global Ecology & Biogegography, 10, 345–357.

Milligan, R. H., Osborne, G. O. and Ytsma, G. 1988. Evidence for an aggregation pheromone in *Platypus gracilis* Broun (Col., Platypodidae). Journal of Applied Entomology, 106: 20-24.

Murphy, D. H. and Meepol, W. 1990. Timber beetles of the Ranong mangrove forests. Mangrove Ecosystem Occasional Papers, 7, 5-8.

Philip, E. 1999. Wilt disease of angsana (*Pterocarpus indicus*) in Peninsular Malaysia and its possible control. Journal of Tropical Forest Science 11, 519-527.

Renwick, J. A. A., Vité, J. P. and Billings, R. F. 1977. Aggregation pheromone in the ambrosia beetle, *Platypus flavicornis*. Naturwissenschaften, 64: 226.

Samson, R.A., Hoekstra, E.S. and Frisvad, J.C. 2004. Introduction to food- and airborne fungi. Seventh Edition. Centraalbureau voor Schimmelcultures, Utrecht, The Netherlands.

Schedl, K. E. 1965. Scolytidae und Platypodidae Afrikas. Band III. Familie Platypodidae. Revista de Entomologia de Moçambique, 5(1963), 595–1352.

Tokoro, M., Kobayshi, M., Saito, S., Kinuura, H., Nakashima, T., Shoda-Kagaya, E., Kashiwagi, T., Tebayashi, S., Kim, C. and Mori, K. 2007. Novel aggregation pheromone, (1*S*,4*R*)-*p*-menth-2-en-1-ol, of the ambrosia beetle, *Platypus quercivorus* (Coleoptera: Platypodidae). Bulletin of FFPRI, 6: 49-57.

Wood, S.L. and Bright , D.E. 1992. A catalog of Scolytidae and Platypodidae (Coleoptera), part 2: taxonomic index, volume B. Great Basin Naturalist Memoirs 13, 835-1553.

Zanuncio, J. C., Sossai, M. F., Couto L. and Pinto R.. 2002. Occurrence of *Euplatypus parallelus*, *Euplatypus* sp. (Coleoptera: Euplatypodidae) and *Xyleborus affinis* (Coleoptera: Scolytidae) in *Pinus* sp. in Ribas Do Rio Pardo, Mato Grosso Do Sul, Brazil. Revista Arvore 26, 387-389.

Zanuncio, J. C., Sossai, M. F., Flechtmann, C. A. H., Zanuncio, T. V., Guimaraes E. M. and Espindula. M. C. 2005. Plants of an *Eucalyptus* clone damaged by Scolytidae and Platypodidae (Coleoptera). Pesquisa Agropecuaria Brasileira 40, 513-515.