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# Infestation of pinhole borer [*Euplatypus parallelus* (F.)] on *Dalbergia latifolia* Roxb.

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## Abstract

*Dalbergia latifolia* Roxb. (Indian rosewood) is India's one of the main timber tree. This is the first report of infestation of *D. latifolia* by *Euplatypus parallelus* (Fabricius, 1801) (Coleoptera: Curculionidae: Platypodinae), beetle in Karnataka, India. Pinhead-sized holes with reddish resinous exudation oozing from them and blackened areas around the holes caused by the ambrosia fungi are the characteristic feature of infestation. *Fusarium oxysporum* Schlecht. was isolated from infected portion of sapwood. Infested trees wilt, lose leaves and die. The infection may seriously threaten Indian rosewood.

## Keywords

Agroforestry, Ambrosia beetle, Frass, Indian rosewood

## Introduction

*Dalbergia latifolia* Roxb. (Family: Fabaceae), commonly known as "East Indian rosewood", "*kala- shisham*" in Hindi and "*Beete*" in Kannada, is a slow-growing high value timber species. It is native to low-elevation tropical forests of south India. Karnataka provided more than 50% of India's *D. latifolia* supply. Kerala, Tamil Nadu, Gujarat, Madhya Pradesh are also sources of rosewood. Rosewood is used for furniture, musical instruments, plywood, veneer and carved wood products. The species is listed as 'Vulnerable' (IUCN Red List) and placed in Appendix -II of CITES. As a legume, the species can fix nitrogen through symbiotic rhizobium bacteria on its roots, making it ideal for agroforestry.

In a 5-year-old agroforestry plantation at Pandarally, Chitradurga of Karnataka state (14°09'34.878" N, 76°19'38.910" E) India, *D. latifolia* (rose wood) is planted along with *Santalum album* (Sandal wood), *Swietenia macrophylla* (Mahogany), *Mangifera indica* (Mango tree), with *Eleusine coracana* (Ragi) a millet, as intercrop. During field work, we find *D. latifolia* infested by *Euplatypus parallelus* (Fabricius 1801) (Coleoptera: Curculionidae: Platypodinae), an 'ambrosia beetle'. It is native to Central and South America and was brought to Africa, Asia and Oceania through timber trade (1). It is the most damaging and widespread invasive platypodine endangering global livelihoods and the environment (2-4). Adult *E. parallelus* beetles can travel from tree to tree, but natural spread is unknown. It's spread was mainly by transporting infected wood and packing material between countries (4-6). *E. parallelus* is very polyphagous, reported to feeding on at least 25 plant families, including gymnosperms (7). Ambrosia beetles live with fungi. Some are fungal diseases vectors (8, 9). In the tropics, they do considerable damage to timber and the wood industry (6). In India, *Areca catechu* (Areca nut) in-

festations and rubber trees mortality have been documented for this beetle (10). Insect biology is unknown. Yellowish-brown adults are 3.8-4.5 mm long. Ambrosia fungi pertain to *Ambrosiella, Raffaelea, Monacrosporium* and *Phialophoropsis. Fusarium, Acremonium, Candida* and *Graphium* genus have been linked to ambrosia beetles (11-13). The beetles' hidden life in the wood makes its control tough.

## Materials and Methods

### *Study site*

The present studies have been carried out in a 5-year-old agroforestry plantation established in 2 ha land at Pandarally village, Chitradurga, Karnataka (14°09'34.878" N, 76°19'38.910" E). It is surrounded predominantly by agricultural land.

### *Methodology*

The collected insects (Beetle) were identified as *E. parallelus* referring to standard literatures (1, 3) and voucher specimens are deposited in the Entomology Division, Gandhi Krishi Vigyana Kendra (GKVK), University of Agricultural Sciences (UAS), Bengaluru. Although, *Artocarpus heterophyllus* Lam., *Mangifera indica* L., *Phyllanthus emblica* L., *Santalum album* L., *Swietenia macrophylla* King, *Tamarindus indica* L., etc were cultivated with *Eleusine coracana* Gaertn. (millet) as intercrop, only *D. latifolia* was infested. Reddish brown resinous exudation from afflicted stems and small pinhead size holes are the evident symptoms. On the second day, infestation was found to spread to multiple points on the stem and 2-3 more rosewood trees. On day 5, 5 to 6 rosewood trees were infected. All afflicted trees oozed reddish frass, which honeybees fed on. The reddish brown frass from the infested rosewood trees was collected in to clean vial and analysed for chemical composition. After 5 days, infested trees wilted. Stripping of infected stem wood showed the insect population structure. Larvae and eggs were detected in simple galleries with a single branch. Larval galleries were 1.3- 1.5 mm wide. In a single gallery system, larvae, pupae and adults coexisted (overlapping generations). Adult beetles are slender, 3.8- 4.2 mm long and brownish and hairy (Fig. 1. A-F). Fungal isolation was performed from the sapwood, frass and insects by culturing on Potato Dextrose Agar (PDA) without antibiotics.

The cultures were microscopically examined, photographed and fungi were identified based on morphology (14) and identified as *Fusarium oxysporum* Schlecht. Ft. a wilt causing fungi. The spread of the beetle may be from the neighbouring sawmill that had beetle infested 'Neem' (*Azadirachta indica*), 'Hebbevu' (*Melia dubia*) and 'Hunalu' (*Terminalia paniculata)* logs, and the infected logs carried by the fuelwood wood collectors near to the plantation. The reddish brown 'frass' from the infested rosewood trees was collected into clean vial and analysed for chemical composition. It consists of Carbohydrates and Sugars (IS 1656:2006 (Reaffirmed 2009), FSSAI Manual of Analysis of Foods- Lab Manual 4.)

## Results

In a 5-year-old agroforestry plantation in Pandarally, near Chitradurga, Karnataka, India we found *D. latifolia* infested with *Euplatypus parallelus* (Fabricus, 1801), a 'ambrosia beetle. This was first report from India or abroad. There were 120 rosewood trees with an average girth of 34 cm. Although, *Artocarpus heterophyllus* Lam., *Mangifera indica* L., *Phyllanthus emblica* L., *Santalum album* L., *Swietenia macrophylla* King, *Tamarindus indica* L., etc., were cultivated with *Eleusine coracana* Gaertn. (millet) as intercrop, only *D. latifolia* was infested with pinhole borer *E. parallelus.* Reddish brown resinous exudation from afflicted stems and small pinhead size holes are the evident symptoms. On the second day, infestation was found to spread to multiple points on the stem and 2-3 more rosewood trees. On day 5, 5 to 6 rosewood trees were infected. All afflicted trees oozed reddish frass, which honeybees fed on. After 5 days, infested trees wilted. Larvae and eggs were detected in simple galleries with a single branch when the afflicted woody stem was dissected. Larval galleries were 1.3- 1.5 mm wide. In a single gallery system, larvae, pupae and adults coexisted (overlapping generations). Adult beetles are slender, 4.2 mm long and brownish and hairy (Fig. 1. A-H).

*Fusarium oxysporum* Schlecht. Ft. was isolated from rosewood frass, sapwood and insects. From a neighbouring sawmill (500 m distant) that had infested 'Neem' (*Azadirachta indica*), 'Hebbev' (*Melia dubia*) and 'Hunalu' *Terminalia paniculate* logs, the insects may have spread by fuel-wood carried by people passing nearby plantation. Localized application of Chlorpyrifos (4 ml $L^{-1}$) along with, Carbendazim (2 g $L^{-1}$) using syringes and soil quenching (5 L per tree) once a week found to effective in controlling infestation. The Chlorpyrifos is broad- spectrum insecticide which kills the insects upon contact by affecting the normal function of the nervous system. The Carbendazium is a broad spectrum fungicide when applied gets into the xylem and spreads to the distal parts. It acts on fungi by inhibiting growth of the mycelia. There by helps the plants to recover from wilt.

## Discussion

Maruthadurai (2013) first reported this species as a pest in India, when it was attacked cashew trees *Anacardium occidentale* L.f. (Family: Anacardiaceae) (15). There are reports on *E. parallelus* infestation on healthy Arecanut palms in Karnataka and Kerala (in India) (16-18). *E. parallelus* is a highly polyphagous species with no apparent preference. It has been reported from over 80 host trees. Its host range includes *Acacia* spp., *Anacardium occidentale* (Cashew), *Areca catechu* (betel nut palm), *Cocos nucifera* (coconut), *Eucalyptus* spp., *Ficus* spp., *Hevea brasiliensis* (rubber tree), *Khaya senegalensis* (African mahogany), *Mangifera indica* (Mango), *Persea americana* (avocado), *Pinus oocarpa, Tectona grandis* (Teak) etc. (20). In Indonesia and Bangladesh tree mortality was reported in *Pterocarpus indicus* and *Dalbergia sissoo* following *E. parallelus* infestation (6, 19, 21). In the study area, *E. parallelus* preferred *D. latifolia* despite


**Fig. 1**. A-H. **A**. Agroforestry plantation with *Dalbergia latifolia,* **B**. A portion of trunk showing infestation., **C**. Reddish brown exudate oozing from stem and infestation by insect *Euplatypus parallelus,* **D**. Microscopic view of insect (Top view), **E**. Honeybees feeding on exudate, **F**. Microscopic view of fungal hyphae and conidia isolated and cultured from the pinhole and insect, **H**. Removing the bark and sap wood to check the depth of the pin hole and to isolate insect. H. Infested portion after fungicide and insecticide treatment.

several other tree species nearby. Massive infestations may damage rosewood population in a climate change scenario. It may pose a serious threat to Indian rosewood due to a decreased wood value and increased tree death. The pathogenic *Fusarium oxysporum* has ranked fifth among top 10 fungal pathogens (22). It is one of the most studied *Fusarium* species, comprising of plant pathogens, endophytes and non-pathogenic strains (23). The pathogenic *Fusarium oxysporum* strains cause vasculars wilts, damping-off, root and foot rot in economically important flowers, vegetables, plantation and field crops (24, 25).

## Conclusion

*Euplatypus parallelus* an widespread invasive found to attack Indian Rosewood live trees. Considering its polyphagous nature and its association of fungi it can cause severe mortality. The massive infestations may damage rosewood natural population in a climate change scenario.

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## Authors contributions

TNM carried out the planning, identification, execution and drafting of manuscript: SMB carried out field observation collection of sample, laboratory work: VSS provided necessary inputs during analysis. All authors read and approved the final manuscript.

## Compliance with ethical standards

**Conflict of interest**: Authors do not have any conflict of interests to declare.

**Ethical issues**: None

## References

1. Atkinson TH. The species of *Platypus* of Florida (Coleoptera: Platypodidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry Entomology Circular.1989;321:1-4.
2. CABI, Undated. CABI Compendium: Status inferred from regional distribution. Wallingford, UK: CABI.
3. Wood SL, Bright DE. A catalogue of Scolytidae and Platypodidae (Coleoptera). Part 2: taxonomic index. Great Basin Naturalist Memoirs.1992;13:1-1553.
4. EPPO Study on the risk of bark and ambrosia beetles associated with imported non-coniferous wood. EPPO Paris. Available from /RESOURCES/eppo publications. 2020. Technical Document No. 1081.
5. Beaver RA. New records of ambrosia beetles from Thailand (Coleoptera: Platypodidae). Serangga.1999;4:29-34.
6. Bumrungsri S, Beaver R, Phongpaichit S, Sittichaya W. The infestation by an exotic ambrosia beetle, *Euplatypus parallelus* (F.) (Coleoptera: Curculionidae: Platypodinae) of Angsana trees (*Pterocarpus indicus* Willd.) in southern Thailand. Songklanakarin J Sci Technol. 2008; 30:579-82.
7. Gümüs EM, Ergün A. Report of a pest risk analysis for *Platypus parallelus* (Fabricius, 1801) for Turkey. EPPO Bull. 2015;45 (1):112-18.
8. Carrillo D, Dunlap CA, Avery PB, Navarrete J, Duncan RE, Jackson MA et al. Entomopathogenic fungi as biological control agents for the vector of the laurel wilt disease, the redbay ambrosia beetle, *Xyleborus glabratus* (Coleoptera: Curculionidae). Biol. Control. 2015;81:44-50. https://doi.org/10.1016/j.biocontrol.2014.10.009
9. Freeman S, Miller G, Protasov A, Maymon M, Elazar M, David-Schwartz R et al. Aposymbiotic interactions of three ambrosia beetle fungi with avocado trees. Fungal Ecol. 2019;39:117-30. https://doi.org/10.1016/j.funeco.2018.11.007
10. Hiremath SR, Prathapan KD. First report of the invasive South American pinhole borer, *Euplatypus parallelus* (Fabricius) (Coleoptera: Curculionidae: Platypodinae), on rubber in India. Coleopt Bull. 2019;73(3):714-17.
11. Batra LR. Ecology of ambrosia fungi and their dissemination by beetles. Trans Kans Acad Sci.1963;66:213-36.
12. Batra LR. Ambrosia fungi: a taxonomic revision and nutritional studies of some species. Mycologia. 1967;59:976-1017.
13. Baker JM, Norris DM. A complex of fungi mutualistically involved in the nutrition of the ambrosia beetle *Xyloborus ferrigineus.* J Invertebr Pathol. 1968;11:246-50.
14. Barnett HL, Hunter BB. Illustrated genera of imperfect fungi. Prentice-Hall. Inc. The American Phytopathological Society, USA;1998.
15. Maruthadurai R. Studies on major insect-pests of cashew and their management. In: Annual Report. 2012-13.
16. Maruthadurai R, Desai AR, Singh NP. First record of ambrosia beetle (*Euplatypus parallelus*) infestation on cashew from Goa, India. Phytoparasitica. 2014;42(1):57-59. https://doi.org/10.1007/s12600-013-0337-6
17. Sreekumar KM, Nanditha KM, Ramesha B. First report of the invasive South American pinhole borer *Euplatypus parallelus* (F.) (Coleoptera: Curculionidae: Platypodinae) on arecanut. Entomon. 2018;43(4):293-94.
18. Thube SH, Mohan C, Pandian RTP, Saneera EK, Sannagoudra HM, Hedge V, Cowdappa P. First record of the invasive neotropical Ambrosia beetle *Euplatypus parallelus* (Fabricius, 1801) (Coleoptera: Curculionidae: Platypodinae) infesting Arecanut in Karnataka, India. Coleopt Bull**.** 2018;72(4):713-16. https://doi.org/10.1649/0010-065X-72.4.713-716
19. Boa E, Kirkendall L. Strengthening national capacity for control of *Pterocarpus indicus* wilt disease. Disease and Forest Protection: Sandragon Wilt Disease, final technical report. Seychelles. 2004;21:124-29.
20. Schedl. Scolytidae und Platypodidae Afrikas, Band 3, Platypodidae, Revista de Entomologia de Moçambique. 1965;5:595-1352.
21. Silva JCP, Putz P, Silveria E, de C Fleann, CAH. Biological aspects of *Euplatypus parallelus* (F.) (Coleoptera, Curculionidae, Platypodinae) attacking *Hevea brasiliensis* (Willd. ex A. Juss.) in São Paulo northwest, Brazil. Proceedings of the III Congresso Brasileiro de Heveicultura (Guarapari, BR, 2013-07-24/26), 4 pp.
22. Dean JA, Van Kan ZA, Pretorius KE, Hammond-Kosack A, Di Pietro PD. Spanu et al. The top 10 fungal pathogens in molecular plant pathology. Molecular Plant Pathology. 2012;13:414-30.
23. Kang S, Demers J, Maria J, Rep M. *Fusarium oxysporum* In, R.A. Dean et al. (eds), Genomics of Plant –Associated Fungi and Oomycetes: Dicot Pathogens. 2014;99-119. https://doi.org/10.1007/978-3-662-44056-8_5
24. Jarvis WR, Shoemaker RA. Taxonomic status of *Fusarium oxysporum* causing foot and root rot of tomato. Phytopathology. 1978;689(2):1679-80.
25. Beckman H, Roberts EM. On the Nature and Genetic Basis for Resistance and Tolerance to Fungal Wilt Diseases of Plants. Advances in Botanical Research. 1995; 21: 35-77.