Journal of Medicinal and Aromatic Plant Sciences 35(3-4) (2013) 111-114

First record and biology of coffee bean weevil (*Araecerus fasciculatus* De Geer) on pesticide plant (*Melia azedarach* L.) from Iran

ABBAS SALAHI ARDAKANI* • HIVA NASSERZADEH

Article History

Received: 18th September, 2013
Revised: 17th November, 2013
Accepted: 18th November, 2013

Key words

Araecerus fasciculatus
Coffee bean weevil
Melia azedarach
Life cycle
Persian lilac pest
Iran

ABSTRACT

Araecerus fasciculatus was recorded for the first time in Iran on the seeds of medicinal and pesticide plant, Melia azedarach L. *About 25% of the mature seeds were found infected by this pest. Biological studies carried out on the collected specimens during showed that females lay eggs on the immature, mature as well as dried harvested seeds. Larval nutrition, development and pupation occurred within the seeds. All motile stages of the pest developed throughout the year in the dried seeds. Adult male and female emerged through chewing of exit holes of the infected seeds. Multiple and overlapping generations of larvae, pupae, and adults were also visible in the infected seeds. The pest completed its life cycle within 43 day under the laboratory conditions.*

© Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow (India)

INTRODUCTION

Ever since the successful documentation of strong pesticidal activities of neem plant in the 20th century in India, members of the family Meliaceae are being intensely prospected for their pesticidal efficacy [3, 10, 23, 27]. Among other phyto constituents, azadirchtin has been found to be most common active pesticidal ingredient in such plants [7]. *Melia azedarach* tree is one such plant whose killing, repellent and antifeedant properties against plant pests and disease causing agents such as mematodes, insects, fungi, bacteria, mites etc have been thoroughly investigated [1, 2, 8, 10, 12, 14, 20, 21]. *M. azedarach,* which is also known as bead tree, chinaberry, Paradise tree, Persian lilac or white cedar is an indigenous tree of Himalayan region that grows widely in northern Iran [18, 28]. The plant is known to possess a high level of resistance to insect pests and has excellent adaptability to a wide range of soil and agro-climate [2, 21]. During an investigation on the evaluation of nematicidal action of *M. azedarach* on root knot nematode, *Meloidogyne* in Iran, we observed for the first time the presence of coffee bean weevil (*Araecerus fasciculatus* De Geer) in the seeds of this tree (Fig 1 A-D). The coffee bean weevil of the family Anthribidae is a world-wide serious insect pest of cocoa and coffee [29]. It is originally an Indo-Malayan species [4] which is now well represented in tropical, sub-tropical and regions including the central & southern America, Asia, tropical Pacific and Australia [7, 19].

The life cycle and behavior of *A. fasciculatus* as it operates in the infected immature, mature and dried harvested seeds of *M. azedarach* under natural as well as laboratory condition is

*Corresponding author: salahi_abbas@tahoo.com

Department of Plant Protection, Agricultural and Natural Resources Research Center, Kohgilouyeh va Boyerahmad Province, Yasouj, Iran.

Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Tehran, Iran
Doi: https://doi.org/10.62029/jmaps.v35i3.Ardakani

summarized in this report as a first record from Iran.

MATERIALS AND METHODS

Seed sampling and insect rearing

Immature, matured and dried seeds of *M. azedarach* were collected during summer and autumn seasons in 2012 and 2013 from Sari Mazandaran province of northern Iran. Percentage of seeds showing coffee bean weevil infection were recorded at each sampling time. The seed samples were brought to the department of plant protection of agricultural and natural resources research centre at Yasouj, Iran. The seeds were stored in insect growth vessels maintained at 27°C and 60% relative humidity under normal day light. The seeds were examined daily for the emergence of the insects. The insects that appeared were stored in 75% ethanol until sent for identification. Data pertaining to insect life cycle observations was recorded under both natural and laboratory conditions.

Pest identification

Adult beetles were examined using a binocular microscope (Zeiss Stemi SV11). Male genitalia were dissected, macerated and cleared in concentrated lactic acid and mounted on the same card with the specimen. Pictures of the beetles were taken with a digital camera (Cannon, IXUS 3.2) and processed by Photoshop CS5 software. Identification of the insect was confirmed by Dr. P. Baòaø of Moravian Museum, Brno, Czech Republic and Dr. M. Trýzna of Czech University of Life Sciences, Prague, Czech Republic.

RESULTS AND DISCUSSION

Araecerus fasciculatus De Geer is recorded for first time from the seeds of *M. azedarach* seeds in Iran. Based as its general features, *A. fasciculatus* can easily be confused with other species of bruchids found as pest of stored products but presence of an antennal club, the entire eye and the elytra without distinct striation can distinguish it from related bruchid insects [5].

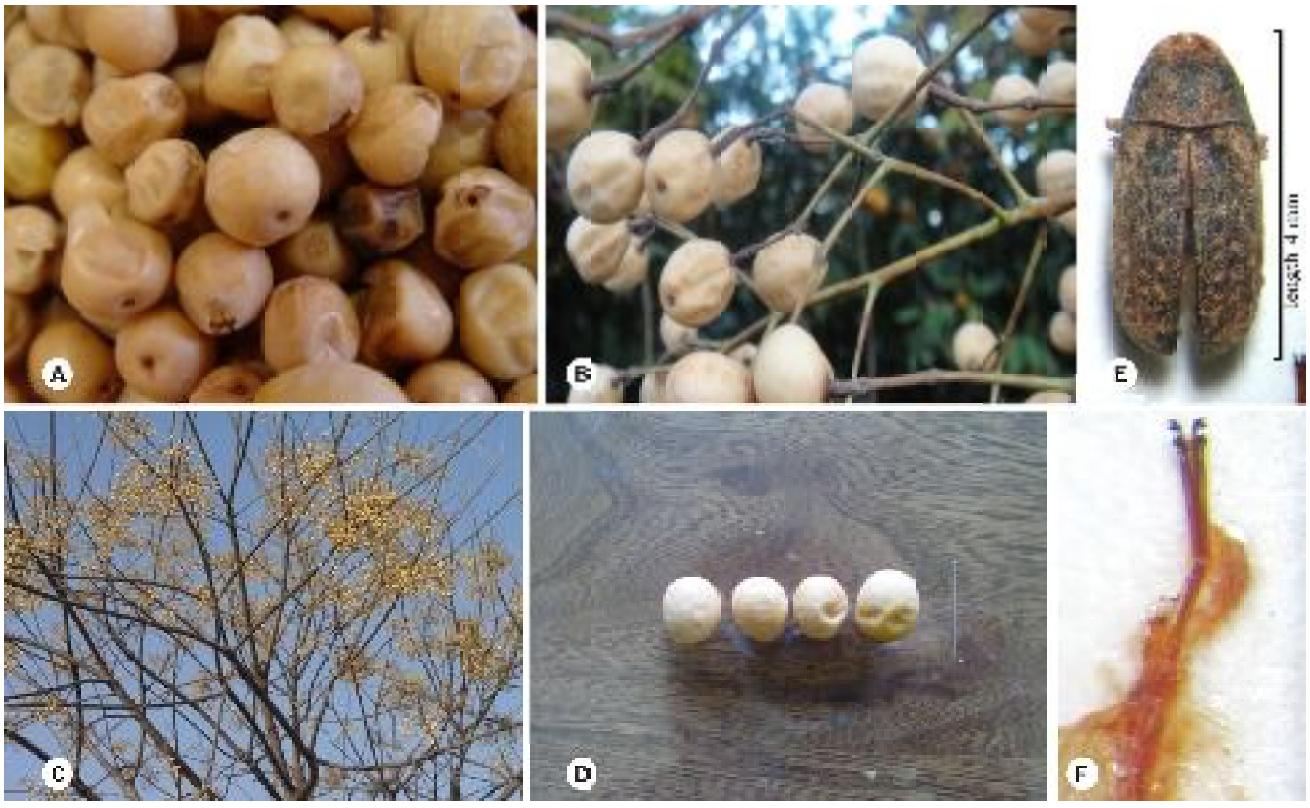


Fig 1(A-F): Seeds of *M. azedarach* infected with *A. fasciculatus* (A, B); infected seeds of *M. azedarach* remaining on the tree during winter (C); healthy seeds of *M. azedarach* (D); morphology of *A. fasciculatus* (E); Male external genitalia of the pest (F).

Body length of the adult beetles has been reported to be about 3–5 mm [5, 9, 23]. Observations made in the present study matched with this dimension range (4mm; Fig 1E). Sexual dimorphism was seen between males and females. Males had the last exposed tergum vertical and therefore distinct from females that had tergum inclined and distinct. Field and laboratory observations also indicated that egg laying frequency in the immature and mature seeds present on the plant were comparable with that in harvested and dried seeds. Normally, the clusters of dried seeds remained on the trees after defoliation until next spring (Fig 1C). The seed damage was primarily caused by the larvae. The larvae fed, developed and pupated within the seeds. Adults bored the circular holes and emerged from the seeds. Except seeds no other plant part was found to be attacked by the pest. All motile stages of the insect fed and developed in the dried seeds. Our results also showed that multiple and overlapping generations of the insect with larvae, pupae, and adults were present in the infected seeds. In earlier studies on this pest six overlapping generations per year were recorded in China [6, 16]. However in another study only 3-4 generations in a year and 5 generations in a special year were observed [15]. These workers have reported that numbers of the insect generations was dependent on variation in whether condition during the year. We have also observed that the over-wintering of *A. fasciculatus* was depended on its larvae. In the natural condition, the adults were not visible during winter conditions. Life cycle of the *A. fasciculatus* in our experiments completed after 43 day under the lab condition. It can be concluded from the results of this study that though coffee, cocoa, yains, maize, groundnut, Brazil nut, nutmeg, ginger, citrus and sweet potato plants are the most preferred and widely reported hosts of *A. fasciculatus* [6, 16, 19, 22, 29], but the pest is capable of attacking the bitter seeds of *M. azedarach* in the absence of its favorite hosts in north Iran. Therefore, necessary care should be exercise in promoting extensive cultivation of *M. azedarach* as a pesticidal crop in the tropical countries to control the spread of this devastating insect pest.

ACKNOWLEDGEMENTS

We deeply appreciate Dr. P. Baòaøand and Dr. M. Trýzna (Czech Republic) for their kind help and cooperation during species identification.

REFERENCES

1. Alkhail AA. 2005. Antifungal activity of some extracts against some plant pathogenic fungi. *Pak J Biol Sci* **8**: 413-417
2. Ardakani AS. 2012. Effects of *Melia azedarach* on *Meloidogyne incognita in vitro* and *in vivo* conditions. *Nematlogia Mediterranea* **40**: 55-60
3. Biswas K, Chattopadhyay J, Banerjee RM, Bandy opdyodhyay U. 2002. Biological activities and medicinal properties of neem (*Azadirachta indica*). *Curr sci* **82**:1336-1345
4. Bousquet Y. 1990. *Beetles Associated with Stored Products in Canada: An identification guide*. Agriculture Canada Publication, Ottawa, Canada.
5. Bright DE. 1993. *The weevils of Canada and Alaska. Volume 1: Coleoptera: Curculionoidea, excluding Scolytidae and Curculionidae, Insects and Arachnids of Canada.* Handbook Series. **21**: 217
6. Childers CC. 1982. Coffee bean weevil, a pest of citrus in Florida: Injury to citrus, occurrence in citrus, host plants, and seasonal activity. *J Econ Entomol* **75**: 340-347
7. Chitwood DJ. 2002. Phytochemical based strategies for nematode control. *Ann Rev Phytopathol* **40**: 221-249
8. Coria C, Almiron W, Valladares G, Carpinella C, Ludueña F, Defago M, Palacios S. 2008. Larvicide and oviposition deterrent effects of fruit and leaf extracts from *Melia azedarach* L. on *Aedesa egypti* (L.) (Diptera: Culicidae). *Bioresource Technol* **99**: 3066–3070
9. El-Sayed MT. 1940. The morphology, anatomy and biology of *Araecerus fasciculatus* De Geer (Coleoptera: Anthribidae). Bulletin de la Societe Fouadler *d' Entomologie* **24**:82.151

10. Grane M, Ahmad S. 1988. *Hand Book of Plants with Pest Control Properties*. John Wiley and Sons, New York.

11. Karaman I, Sahin F, Gullule M. 2003. Antimicrobial activity of aqueous and methanol extracts of *Juniperus oxycedrus* L. *J Ethanopharmacol* **85**:231-235

12. Khan AV, Ahmed QU, Mir MR, Shukla I, Khan A. 2011. Antibacterial efficacy of the seed extracts of *Melia azedarach* against some hospital isolated human pathogenic bacterial strains. *Asian Pacific J Tropi Biomed* **1**: 452–455

13. Knoblock K, Weis K, Wergant R. 1989. *Mechanism of Antimicrobial Activity of Essential Oils*. Proceedings of 37th Annual Congress of Medicine Plant Research, (ACMPR89), Braunschweig.

14. Konstantopoulou I, Vassilopoulou L, Mawogantisi PP, Scouras G. 1994. Insecticidal effect of essential oils, a study of essential oils extracted from eleven Greek aromatic plants on *Drosophila auroria*. Experientia **48**: 616-619

15. Li C, Li ZZ. 2010. Damage and life history of *Araecerus fasciculatus* in Guizhou. Guizhou Agricultural Sciences, Available at: http://en.cnki.com.cn/Article_en/CJFDTOTAL GATE201003029.htm

16. Lin T. 1976. Studies on life cycle and control of coffee bean weevil, *Araecerus fasciculatus* (De Geer) (Coleoptera: Anthribidae). *J Agricul Res China* **25**: 44-52

17. Löbl I, Smetana A. 2011. *Catalogue of Palearctic Coleoptera*, vol. 7.Apollo Books, pp.373

18. Mozafarian V. 1998. *A dictionary of Iranian Plant Names*. Tehran, Iran. Farhang Moaser. p.740

19. Mphuru AN. 1974. *Araecerus fasciculatus* L. de Geer (Coleoptera: Anthribidae): A review. *Trop Stored Prod Information* **26**:7-l5

20. Nardo EAB, Costa AS, Lourencao AL. 1997. *Melia azedarach* extractas an antifeedant to *Bemisia tabaci* (Homoptera: *Aleyrodidae*). *Florida Entomol* **80**: 92–94

21. Neycee MA, Nematzadeh GHA, Dehestani A, Alavi M. 2012. Assessment of antifungal effects of shootextracts in chinaberry (*Melia azedarach*) against 5 phytopathogenic fungi. *Intl J Agric Crop Sci* **4**:474-477

22. Rint JR, Rejesus BM. 1988 Host preference of coffee bean weevil, *Araecerus fasciculatus* de Geer (Anthribidae: Coleoptera) and its susceptibility to organophosphates and synthetic pyrethroids. In: *Naewbanij JO (Ed.) Asean Grain Postharvest Programme*, p. 143-157. Bangkok, Thailand.

23. Robinson WH. 2005. *Handbook of Urban Insects and Arachnids: A handbook of urban entomology*. Cambridge University Press, UK.

24. Saxena RC, Jilani G, Abdul Karim A (1989) Effects of neem on stored grain insects. In: Jacobson M (Ed.) *Focus on Phtochemical Pesticides, Vol 1, The Neem Tree;* pp.97-111. CRC Boca Roton, Are Press, Florida (USA).

25. Schmutterer H (Ed.) 1995. The neem tree *Azadirachta indica* A. Juss. and other Meliaceous plants: source of unique natural products for integrated pest management, medicinal, industry and other purposes. VCH Verlagsgesellschafft Publisher, Weinheim, Germany.

26. Singh S, Sitaramaiah K. 1967. Incidence of root knot of okra and tomatoes in oil cake amended soil. *Pl Dis* **50**: 668-672

27. Singh S, Sitaramaiah K. 1970. Control of plant parasitic nematodes with organic soil amendments. *Pharmacy Associ Nova Scotia* **16**: 287- 297

28. Taghavi SM, Ghasemi Y. 2010. Etiology of chinaberry gall disease in Iran. *Iran Agric Res* **29**: 13-20

29. Valentine BD. 2005. The scientific name of the coffee bean weevil and some additional bibliography (Coleoptera: Anthribidae: *Araecerus* Schönherr). Insecta Mundi **19**:247-251.