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Biodiversity of borer insect-pests infesting citrus in Punjab

S. SINGH AND G. KAUR

ICAR-Consortium Research Platform on Borers in Network Mode
Department of Fruit Science, Punjab Agricultural University,
Ludhiana 141 004, Punjab, India

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ABSTRACT

Insect-pests play a major role among the various limiting factors in the successful cultivation of citrus crops. Recently, borer insect-pests have emerged as new threat for the citrus growers. The present surveys were aimed for studying the biodiversity of different borer insect-pests infesting citrus plants in Punjab. Roving and fixed plot surveys were conducted in citrus growing areas of the three agro-climatic zones of to record the biodiversity of borer insect-pests during 2013-14 and 2014-15. This study reports six borer insect-pests on citrus crops in the Punjab which includes Citrus bark borer, Agrilus citri Thery, Citrus root borer, Dorysthernus (Lophosternus) huegelii (Redtenbacher), American bollworm, Helicoverpa armigera (Hubner), bark eating caterpillar, Indarbela sp., stem borers, Batocera rufomaculata (De Geer) and Batocera rubus (Linnaeus), and pomegranate butterfly, Virachola (=Deudorix) isocrates (Fabricius).

Keywords: Borers insect pests, citrus, diversity, Punjab

Citrus spp. ranks 3rd after banana and mango in area and production in India. It occupies 12.5 per cent of total fruit production in India during 2014-15. Major citrus producing states in India are Andhra Pradesh, Madhya Pradesh, Punjab and Maharashtra, respectively (NHB, 2013). The Citrus fruits comprising of Kinnow mandarins, sweet oranges, lime and lemons are of major economic importance in Punjab. Citrus cultivation in Punjab covers an area of 50.4 thousand ha with a production of 1044.2 thousand MT and 37.3 thousand kg yield ha^{-1} (Anon., 2015). Kinnow ranks first in area and production followed by sweet orange, lime and lemons. The districts of Fazilka, Hoshiarpur, Ferozepur and Faridkot, occupy over half of the area under Kinnow in the state. The citrus fruits are rich source of vitamin C (25-60 mg of vitamin C 100 g^{-1} of juice). Among the various limiting factors in the successful cultivation of citrus crops, insect-pests play a major role. On an estimate, 30 per cent of the fruits are lost because of insect-pests infestation on citrus (Bindra, 1957). About 45 insect-pests have been reported infesting different plants parts of citrus trees in Punjab (Singh *et. al.,* 2013). Recently, borer insect-pests have emerged as new threat for the citrus growers. The present surveys were aimed for studying the biodiversity of different borer insect-pests infesting citrus plants in Punjab.

MATERIAL AND METHODS

Roving and fixed plot surveys were conducted in citrus growing areas of the three agro-climatic zones of Punjab (south-western arid-irrigated zone, central plain zone and sub-mountainous zone) to record the biodiversity of borer insect-pests during 2013-14 and 2014-15. Fifty plants from each of the orchards were observed randomly to record the presence or absence of borer pests. Fixed plot surveys were also done at Fruit Research Farm and college orchard of Punjab Agricultural University (PAU), Ludhiana. Different life stages of borer insect-pests were collected and reared in Fruit Entomology Laboratory in the Department of Fruit Science, PAU, Ludhiana. Specimens of different borer insect-pests were got identified from Division of Entomology, Indian Agricultural Research Institute (IARI), New Delhi; National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru and Department of Entomology, PAU, Ludhiana.

RESULTS AND DISCUSSION

During the surveys, six borer insect-pests, infesting different parts of citrus plants were observed in Punjab (Table 1; Plate 1). Citrus bark borer, *Agrilus citri* Thery (Coleoptera: Buprestidae) was found to be active from March to April, 2014 and 2015 at Ludhiana and it caused damage to bark of kinnow and lemon plants. The grubs were observed to make holes in the trunk and in case of severe infestation, complete drying of the infested tree was observed. Neglected kinnow and lemon plants were more infested as compared to other plants. An average of five adults per 100 cm branch of kinnow plants were observed. 80 per cent of infested plants were damaged due to attack of citrus bark borer (Fig.1). Citrus root borer, *Dorysthernus* (*Lophosternus*) *huegelii* (Redtenbacher) (Coleoptera: Cerambycidae) was active during 2nd week of June to last week of July, 2014 in district Hoshiarpur. Other than kinkow, peach and guava were also observed to be its hosts. The grubs were observed on the roots of the plants which led to the drying of trees, smaller size of the leaves and cracking on the trunk. Five adults $plant^{-1}$ were observed

E-mail: sandeep_pau1974@pau.edu

on infested trees causing 40 per cent damage. *Dorysthenes* (*Lophosternus*) *huegelii* is reported to be a major pest of apple from Himachal Pradesh (Rana *et. al.*, 2004). American bollworm, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) was found to be active on fruits and leaves of kinnow during April to May, 2014 and April, 2015. Larvae were observed to feed on leaves, flowers buds and small-sized fruits of kinnow. Leaves were eaten from margin toward inwards and clean circular holes were observed on flower buds and small fruits. The attacked buds did not open and were shed prematurely. Infested fruits became black in colour and also dropped prematurely. The damage has been observed more in kinnow and sweet orange orchards in Abohar (district Fazilka). Its severe damage was observed on kinkow and daisy tangerine fruits and

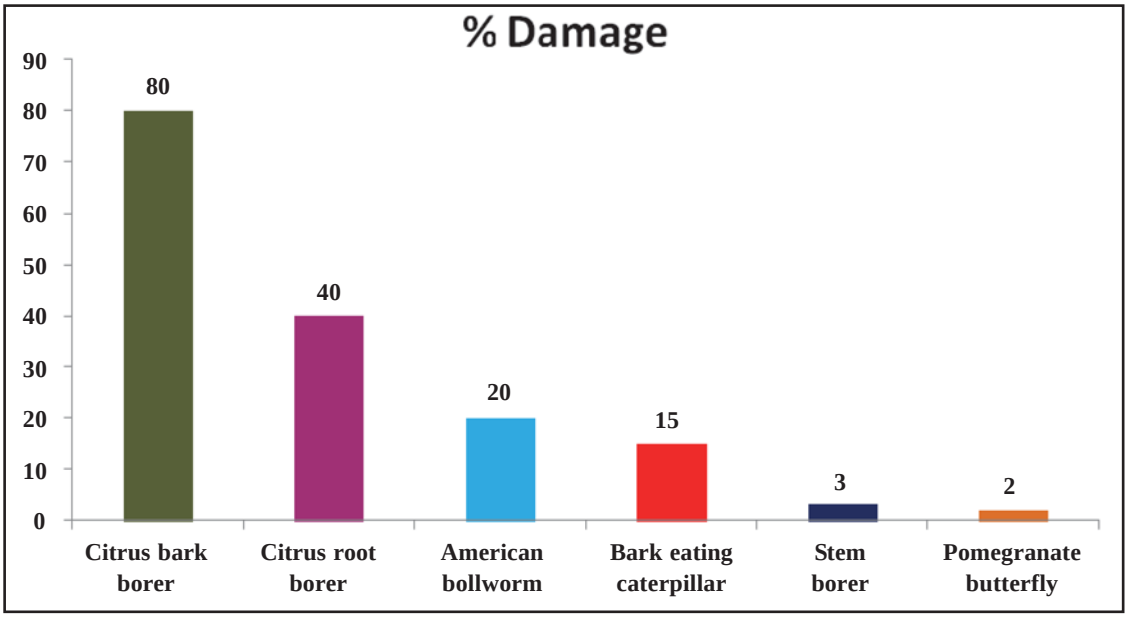

Figure 1: Percent damage caused by borer insect-pests on citrus during 2013-14 and 2014-15

Table 1: Biodiversity of borer insect-pests of citrus in Punjab

Common name	Zoological name (Order : Family)	Host plant	Plant parts infested	District	Activities period	Population
Citrus Bark borer	*Agrilus citri* Thery (Coleoptera:Buprestidae)	Kinnow and lemon plants	Bark	Ludhiana	March-April	5 adults/100
Citrus root borer	*Lophosternus huegelii* (Coleoptera:Cerambycidae)	Kinnow	Roots	Hoshiarpur	2nd Week of June-last week of July	5 adults/plants
American bollworm	*Helicoverpa armigera* (Hübner) (Lepidoptera:Noctuidae)	Kinnow and daisy tangerine	Fruits & leaves	Amritsa, Tarantaran & Fazika	April-May	15 larvae/50 fruits
Bark eating caterpillar	*Indarbela* sp. (Hübner) (Lepidoptera:Metarbelidae)	Kinnow	Bark	All zones surveyed	April-September	15 larvae/ plant
Stem borer caterpillar	*Batocera rufomaculata* (De Geer) and *Batocera rubus* (Linnaeus) (Coleoptera:Cerambycidae)	Kinnow	Stem	All zones surveyed	April-September	3 holes/ plant
Pomegranate butterfly	*Virachola* (=*Deudorix*) *isocrates* (Fabricius) (Lepidoptera:Lycaenidae)	Kinnow	Fruits	Ludhiana	September	1 larvae/ fruit

Grub of citrus bark borer

Damage of citrus bark borer

Grub of citrus root borer

Adult of citrus root borer

Larva of American bollworm

Larva of Bark eating caterpillar

Damage of bark eating caterpillar

Grub of stem borer

Adult of stem borer

Larva of pomegranate butterfly

Plate 1: Borer insect-pests of citrus in Punjab.

leaves in district Amritsar and Taran Taran during May 2014. Fifteen larvae of *Helicoverpa* were observed per fifty fruits of infested citrus trees and caused 20 per cent damage to the plants. Rajapakse and Walter (2007) also reported citrus spp. as a major host for American bollworm in Australia. *Indarbela* sp. (Lepidoptera: Metarbelidae) (bark eating caterpillar) was observed in all the zones surveyed during April to September, 2014 and April, 2015. Damage was usually observed in neglected and old orchards. Larvae were observed to make holes in the stems and limbs for hiding and fed on the bark. Webbing consisting of silken threads, frass and excreta was observed on the bark of the main stem especially near the forks. Severe damage was observed to cause death of the attacked stem. Blackish/dirty grey coloured larvae having dark head were observed underneath the fresh webbing. The larvae made the tunnels near the union of branches. Attacked trees lost their vigour. Branches above the attacked portion started drying and splitting of the trunk occurred near the union of branches. Faecal matter and wooden frass was observed hanging on the tree trunk and branches and it was observed to be symbolic of the larval presence inside the tunnels. Infested plants had shortened life span and low productivity. Fifteen larvae of bark eating caterpillar per plant were observed causing 15 per cent damage to the infested trees. Sweet oranges are reported to be more favoured by bark eating caterpillar as compared to other citrus spp. (Sandhu *et al.*, 1979). Along with other factors including, it is also responsible for the citrus decline in India (Singh, 1998). Patel and Patel (2003) also reported bark eating caterpillar as major insect-pest of citrus spp. in Gujarat. Bark eating caterpillar caused 88 to 92 per cent damage in neglected orchards of citrus and mango and also it is a polyphagous pest infesting 16 fruit crops in India (Gupta *et. al.,* 2014). Grubs of stem borer, *Batocera rufomaculata* (De Geer) and *Batocera rubus* (Linnaeus) (Coleoptera: Cerambycidae) were found to be infesting stem of kinkow plants, in all the surveyed zones during April to September, 2014. Branches of the infested plants shed leaves, Zigzag burrows were observed beneath the bark, sap and masses of frass were seen exuding from the bored holes, attacked stems died and withered away. On an average three holes per plant were observed on infested trees causing damage approximately 3 per cent. *Virachola* (=*Deudorix*) *isocrates* (Fabricius) (Lepidoptera: Lycaenidae) (Pomegranate butterfly) was found to be active during September, 2013 in district Ludhiana. The larvae damaged the fruits by boring into the rind and feeding on the pulp. The infested fruits were also attacked by microbes and caused fruit rotting. The excreta were observed sticking around the holes. Larvae caused 2 per cent damage on an average and 1 larvae/ fruit of infested tree was noted. It is reported to cause 4.54 per cent fruit damage in citrus in Madhya Pradesh (Verma *et al.,* 1995).

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REFERENCES

Bindra, O.S. 1957. Insect pests of citrus and their control. *Indian J. Hort.*, **14**(2): 89-98.

Gupta, D., Naram, S. and Bhatia, R.S. 2014. Incidence, intensity and management of bark eating caterpillar, *Indarbela* sp. infesting fruit trees in Himachal Pradesh, India. *Pest Mgmt. Hort. Ecosys.*, **20**(1): 1-7.

National Horticulture Board Database, 2013. National Horticulture Board, Government of India.

Patel, P.S. and Patel, G.M. 2003. Field survey on the intensity of major pests in kagzi lime orchards in North Gujarat. *Pest Mgmt. Econ. Zool.*, **11**(1): 83-84.

Rajapakse, C.N.K. and Walter, G.H. 2007. Polyphagy and primary host plants: oviposition preference versus larval performance in the lepidopteran pest *Helicoverpa armigera*. *Arthropod-Plant Interactions*, **1**(1): 17-26.

Rana, V.K., Bhardwaj, S.P. and Kumar, R. 2004. Evaluation of insecticides against apple root borer *Dorysthenes huegelii* (Cerambycidae: Coleoptera). *Indian J. Agric. Sci.*, **74**(5): 287-288.

Sandhu, G.S., Sohi, A.S. and Batra, R.C. 1979. Field preference of bark-eating caterpillar, *Indarbela quadrinotata* (Walker) on citrus and guava cultivars. *Indian J. Entomol.*, **41**(3): 274-276.

Singh, S. 1998. Status of citrus decline in India: a review. *Agric. Rev. Karnal*, **19**(4): 227-238.

Singh, Sandeep., Sharma, D.R., Rattanpal, H.S., Kaur, S., Arora, A. and Singh, G. 2013. Current scenario of insect and mite pests of Citrus in the Punjab. In: New Horizons in Insect Science. (Eds: A.K. Chakravarthy, C.T. Ashok Kumar, Abharam Verghese and N.E. Thyagaraj. *International Conference on Insect Science*. University of Agricultural Sciences GKVK, Bangalore. Feb. 14-17.

Verma, R.S., Ali, S.A., Badaya, A.K., Shaw, S.S. and Veda, O.P. 1995. Nature and extent of damage caused by pomegranate butterfly, *Virachola isocrates* Fabr. in mosumbi Citrus sinensis. *Bhartiya Krishi Anusandhan Patrika*, **10**: 40-42.