



## Record of longhorn beetle (*Aeolesthes holosericea*) on mango in the Punjab

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### ABSTRACT

Roving and fixed plot surveys were conducted in mango growing areas of the Indian Punjab to record the emerging insect pests. During these surveys, longhorn beetle, *Aeolesthes holosericea* (Fabricius, 1787) (Coleoptera: Cerambycidae) was observed for the first time on mango in the Indian Punjab, infesting stems of 25 to 40 years old trees at Government Garden and Fruit Nursery, Bhunga, district Hoshiarpur during 2017. The stem borer was active from February to November, with peak activity during August to October. Grubs were observed in the stem and below the bark. The number of grubs from a single tree ranged from 2.1 to 30.3, while number of beetles per tree ranged from 5.7 to 32.3. About 40.3% trees in the orchard were found to be infested by the borer. Continuous monitoring and integrated management of this beetle needs attention so that the borer may not spread to other fruit crops and forest trees in Punjab. This study concludes that *A. holosericea* might be a new emerging stem borer pest of mango trees in the Indian Punjab.

**Key words:** Cerambycidae, Coleoptera, Longhorn beetle, Mango, Stem borer pest

Mango is the most important fruit crop of India occupying an area of 2258 thousand ha, with 21,822 thousand metric tons production and 8.7 metric tons/ha productivity (Anonymous 2019a). It contributes ~ 21.2% of the total fruit production in India and ranks first in area and second in production after banana. India contributes 42.2% of total world production followed by China, which contributes 11.2% (Anon. 2019b). In India, Uttar Pradesh is the leading mango producing state with contribution of 23.06% of the total mango production while Andhra Pradesh is the leading state in area by accounting for 14.72% of total area under mango (National Mango Database 2019). In Punjab, mango is cultivated in an area of 6.75 thousand ha with a production of 115.35 thousand MT and 16.8 MT/ha productivity (Package of Practices PAU 2018).

However, the mango crop suffers heavy damage due to several insect and mite pests. About 400 species of insect-pests are known to infest mango in different parts of the world (Tandon and Verghese 1985, Reddy *et al.* 2018). About 30 insect-pests have been reported infesting different plant parts of mango trees in Punjab (Singh 2018).

Tree borers belonging to the family Cerambycidae are one of the serious concerns (Bezark *et al.* 2013). Grubs of this family initially bore into the tree's sub-cortex. In case of severe infestation of borers, the entire tree dries and dies. This family comprises more than 36,000 species within 1,500 genera in 8 subfamilies in the world. They are also commonly known as longhorn beetles. Adults are elongate and sub-cylindrical beetles ranging in length from 2 mm to more than 160 mm (Monné *et al.* 2017).

The tree borers belonging to genus *Batocera* are considered as serious pests of mango in India. The common species found in India include *Batocera rufomaculata* (De Geer), *B. rubus* (Linnaeus), *B. roylei* (Hope), *B. numitor* (Newmann) (Reddy *et al.* 2018). Keeping in view the expansion of the host range of cerambycid borers and increasing demand of mango fruits in Punjab, surveys were conducted to document the emerging insect pests infesting mango trees.

### MATERIALS AND METHODS

The study was conducted during 2017–18. Roving and fixed plot surveys were carried in the mango growing areas of the sub-mountainous zone of Indian Punjab to record the biodiversity of emerging insect pests. Twenty trees from each of the orchards were surveyed randomly to record the presence or absence of insect pests and their intensity levels. During these surveys, upon observations of longhorn borer on mango, extensive studies were taken-up to document the activity of the borer. Likewise, twenty orchards in two districts, viz. Hoshiarpur and Gurdaspur were surveyed for

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Fig 1 Male beetle and damage of *A. holosericea* on mango. A, male beetle; B, Holes on the stem.

longhorn beetle infestation in mango. Different life stages of the insect pests were collected from the orchards and reared in Fruit Entomology Laboratory in the Department of Fruit Science, Punjab Agricultural University, Ludhiana, Punjab. The infested plant parts were also kept for allowing the emergence of adults. Specimens of adult of stem boring beetle were sent to ICAR-National Bureau of Agricultural Insect Resources, Bengaluru, India for identification. The specimens were identified as *Aeolesthes holosericea* (Fabricius 1787), which is commonly known as apple stem borer and cherry stem borer in India.

## RESULTS AND DISCUSSION

During the surveys, *A. holosericea* has been recorded as a new emerging insect pest of mango, at Government Garden and Fruit Nursery, Bhunga, district Hoshiarpur, Punjab. Upon scrapping the bark of the affected trees, grubs of the stem boring beetle were observed feeding on stem of 25 to 40 years old trees. Fully mature grubs were 60 mm in length and 12 mm in width and yellowish-white in colour. The pupae were about 41 mm long and 15 mm wide and yellow in colour. Later on as the season progressed, dark brown beetles (Fig 1A) bearing long antennae emerged out. The beetles were active during first week of February to second week of November. Males were smaller in size than the females and possessed very long antennae.

This stem borer is cosmopolitan in distribution and found in different parts of India namely Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bengal, Uttarakhand, Himachal Pradesh, Andhra Pradesh, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Rajasthan and Jammu and Kashmir (Tara *et al.* 2009). Stebbing (1914) reported that *A. holosericea* infests 8 plant species, which increased to 37 species including mango, as reported by Beeson (1941). It is most injurious species which feeds on 45 different plant species in the forest area of India. In India, apple, mango, guava, *Acacia arabica*, *Bombax malabaricum*, *Careya arborea*, *Eucalyptus robusta*, *Ficus bengalensis*, *Shorea robusta*, etc. have been recorded as hosts. Ambethgar (2003) studied the infestation and development of this borer in neem, *Azadirachta indica* from

Tamil Nadu, India. Makihara *et al.* (2008) reported that this beetle is present throughout Sri Lanka, India, Pakistan, South China, Hainan, Thailand, Malaysia, Indonesia and Laos and they recorded it on 46 different plant species. Prakash *et al.* (2010) reported it on Arjun tree, *Terminalis arjuna* (Roxb.) in Andhra Pradesh state of India. Bhawane and Mamlayya (2013) reported wild jack, *A. hirsutus* as a host of this borer in Kolhapur, Maharashtra, India.

In the present study, the grubs were observed to damage green and healthy trees, diseased trees as well as fallen trees. Female usually selects injured portions on the bark for egg-laying and make minute incisions on the injured edges of the bark into which they push their eggs singly. The young grubs feeds on inner layers of the bark and outer layers of the sapwood making shallow, zigzag, wide and long galleries. Grown-up grubs enters the main wood through kidney-shaped entrance hole. Oval round shaped holes were observed on the infested tree (Fig 1B). The main symptoms of damage of the grubs observed on the affected trees include emergence of frass coming out of live holes on the trunk and branches. Lot of frass was observed below the infested trees. Splitting of bark around the attacked area was also observed. The most harmful and serious stage of this stem borer is the grub, as they make longitudinal or transverse galleries on the stem or trunk. As a result, vitality of the tree is greatly reduced. During severe attack, initially some branches of the tree get dried. The tunnels excavated by the grubs are clearly visible and may result in death of the affected trees. Adult beetles were observed to debark the tender twigs, near their point of emergence on the tree trunk. Rahman and Khan (1942) and Gupta and Tara (2013) observed similar symptoms on apple trees in India. They reported that grubs make galleries inside the tree and feed on sapwood. The damage often go unnoticed until plant or a part of plant die. In the present study it was observed that infestation of this borer on mango also leads to secondary infestation of some other beetles on the same tree. Also, the grubs were observed more in grown-up trees as compared to the young trees.

*Diagnostic characters of the insect [Aeolesthes holosericea* (Fabricius, 1787)]: The adult beetle is dark

brown to blackish in colour covered with silvery pubescence; elytra exhibit sparse patches of pubescence that change its brilliancy according to the incidence of the light; antennae longer, slender with sparse but uniform pubescence; head with a feebly bisinuate furrow beneath between the gena; prothorax with irregular wrinkles above, with a smooth space placed centrally that is limited by a longitudinal stretch on each side, marked with a median groove near its anterior end.

Adult male was about 34 mm long and 11 mm wide while adult female was about 38 mm in length and 11 mm wide.

*Number of grubs/tree:* The data recorded on population dynamics (Table 1) revealed that during February 2017, an average of 2.1 grubs/tree were observed. The population of grubs kept on increasing as the season progressed. The number of grubs/tree increased from 5.3 grubs in April to 30.3 grubs/tree in October 2017. Gupta and Tara (2013) have observed 65 to 70 grubs in a single robust branch of apple tree in Jammu and Kashmir region of India

*Number of adults/tree:* On an average of 5.7 adults/tree were observed during February 2017, while it increased to 25.7 and 30.3 adults/tree during September and October 2017, respectively. The average temperature during the period under study ranged from 10 to 42°C.

*Per cent trees infested:* The data recorded on trees infested (%) revealed lower infestation of 8.7% trees during February 2017, while the highest tree infestation was observed during October 2017 when 40.3% trees were observed infested. Sinha *et al.* (2011) reported *A. holosericea*, to damage up to 40% of tropical tasar silkworm host-plants wherever infestation is high under climatic conditions of Ranchi, Jharkhand. Gupta (2015) evaluated infestation rate of *A. holosericea* on different apple cultivars, viz. Red delicious, Ambri, Golden delicious and American apogue in different age groups (0-5 years; 6-10 years and above 10 years) in Jammu Province of Jammu and Kashmir State

and observed it to range between 4.3 to 15.3%. Gupta and Sharma (2015) recorded highest mean infestation of 39.44% of this borer in apple orchards during September followed by 33.32% in August, 32.77% in October, 31.10% in July followed by 25.55% in June and 17.77% in May. They also observed that minimum temperature, maximum temperature, average temperature, morning relative humidity, evening relative humidity and average relative humidity has highly significant positive correlation with the population of stem borer whereas average rainfall has an insignificant effect on the pest population, in apple plantations of Jammu and Kashmir. Jiji *et al.* (2016) recorded this borer on wild jack, *A. hirsutus* from Vellayani, Kerala, and observed 6.66% incidence.

Scan of literature revealed that it is a serious pest of apple trees in Jammu and Kashmir in India (Tara *et al.* 2009; Gupta and Tara 2013; Gupta 2015). Stebbing (1914) reported it from mango trees from India. Rahman and Khan (1942) reported it on cherry from Kulu, Bandrol, Raison, Katrain, Naggar and Manali in the Kulu Valley, Kotgarh and Simla in the Simla hills from the undivided Punjab, presently in Himachal Pradesh, between the altitudes of 3,500 to 8,000 ft above sea level. Their studies on the bionomics of this borer revealed that it requires 2 years and 7.5 months to 3 years to complete a single generation on cherry trees. Mamlayya *et al.* (2009) reported incidence of this beetle on *Samanea saman* and *Albizia lebbeck* trees at Kolhapur, Maharashtra. Gupta and Tara (2013) reported that *A. holosericea* has 7 larval instars and the grub while feeding on the apple trees took about  $17.23 \pm 0.21$  months and  $13.66 \pm 3.31$  days to develop from first instar to mature grub thus completing its larval period in 17 to 18 months including overwintering period of 4-5 months in Jammu and Kashmir. They reported that the pest has a total life span of nearly two years. Salve (2014) reported neem, *Azadirachta indica* Juss. as a new host of this beetle from Maharashtra. Kariyanna *et al.* (2017) reported this borer as an important pest from India on 49 host plants, including mango and other fruit crops and forest trees.

This difference in peak activity period in North India and South India may be attributed due to low temperature in northern parts when grubs undergo hibernation to avoid harsh winter. As *A. holosericea* is observed on wide range of host plants and causing considerable damage to the infested fruit trees affecting the economic yield, continuous and periodical monitoring is advocated for timely implementation of the pest management measures. The pest needs to be contained to prevent further spread to new host plants with effective integrated pest management. Gupta and Tara (2014) carried out experiments on management of this beetle on apple with several insecticides in Jammu and observed that Dichlorvos resulted in 100% reduction in borer population after 30 days and was effective up to 62 days after treatment. The order of the efficacy of different treatments was Dichlorvos followed by Carbaryl > Odonil plugging > Aluminium phosphide > Para dichloro benzene > Petrol plugging > Mud plugging. Chauhan *et al.* (2013) evaluated certain biopesticides against

Table 1 Population dynamics and per cent infestation of *A. holosericea*\*

| Month/year     | Number of grubs observed/tree | Number of beetles observed/tree | Trees infested (%) |
|----------------|-------------------------------|---------------------------------|--------------------|
| February 2017  | 2.1                           | 5.7                             | 8.7                |
| March 2017     | 3.3                           | 6.8                             | 12.3               |
| April 2017     | 5.3                           | 7.3                             | 15.3               |
| May 2017       | 8.7                           | 10.5                            | 17.8               |
| June 2017      | 10.3                          | 13.7                            | 20.3               |
| July 2017      | 14.7                          | 16.5                            | 22.7               |
| August 2017    | 20.3                          | 22.3                            | 28.3               |
| September 2017 | 25.7                          | 26.7                            | 35.7               |
| October 2017   | 30.3                          | 32.3                            | 40.3               |
| November 2017  | 21.7                          | 25.7                            | 38.5               |

\*Mean of 20 trees

*Aeolesthes* sp. infestation in apple orchards of Himachal Pradesh and found that 1% azadirachtin (eco-neem plus) was effective followed by *Beauveria brongniartii* and *Metarhizium anisopliae* in bringing down the infestation. On first sight of borer infestation, the entry holes may be cleaned with an aluminum wire, extract the grub, (if it is present) and sealed with mud paste. The orchards should be maintained healthy, clean and the old and damaged trees in the fruit orchards may be treated timely to prevent the borer infestation.

The perusal of literature revealed that *A. holosericea* has not been reported on mango trees so far under Punjab conditions. So, this study concludes that *A. holosericea* might be a new emerging borer pest of mango trees in the Punjab state of India. It is likely that this beetle might have migrated from adjoining state of Himachal Pradesh from apple orchards and forest trees to Punjab as district Hoshiarpur of the Punjab state lies at the border of Himachal Pradesh state. This stem borer is an established pest of apple under Himachal Pradesh conditions. The survey and monitoring needs to be continued to know its host preferences, seasonal occurrence and other biotic and abiotic factors leading to its dominance in nature. The integrated management of this beetle needs serious attention to contain the spread and severity for timely control so that the borer may not spread to other fruit crops and forest trees in Punjab. The most convenient mechanical control practice is to clean the tunnel with an iron wire and insertion of cotton wool soaked in kerosene oil into it. Later on, the tunnel should be plugged with clay mud or Plaster of Paris.

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