Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8265

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(5), 73-77

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Reviewh Article

Stem Borer Infestation on Muga Silkworm (*Antheraea assamensis*) Host Plants on Som (*Persea bombycina*) and Soalu (*Litsea polyantha*): A review

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Received: 2.07.2020 | Revised: 9.08.2020 | Accepted: 16.08.2020

ABSTRACT

Muga silkworm, Antheraea assamensis Helfer is one of the important semi-domesticated species for the sericulture industry and it has very much contribution towards the sericulture economy. Muga silkworm having 5 to 6 generations in a year. They are feeding different types of host plants, som and soalu are the primary host plants for muga silkworm. One healthy food plant is very much essential for the growth and improvement of the silkworm, as well as it is important for the production of good quality of raw silk. All these host plants damaged by various insects and pests. Among these one of the major pest is stem borer. This stem borer having different species but four species are very dangerous for muga silkworm host plants. It includes Bactotera titana Thoms, Bactotera rufomaculata, Xylotrichus sp., Carpenter moth (Zeuzera multistrigata Moore). This review mainly focuses on stem borer affection of muga silkworm host plants, especially on som (Persea Bombycina) and sualo (Litsaea polyantha), also it covers the life cycle and control measure of these insects.

Keyword: *Muga silkworm, Antheraea assamensis, som, soalu, control measure.*

INTRODUCTION

Muga silkworm, *Antheraea assamensis* is an indigenous species, and especially it is available in the northeastern part of India due to favorable climatic conditions. This species belongs to the order Lepidoptera and family Saturniidae (Singh et al., 2013). Muga silkworm is semi-domesticated and multivoltine in nature. The muga silkworm is feeding different (Primary, Secondary, tertiary) types of host plants. Among these som (*Persea bombycina*) and soalu (*Litsaea polyantha*) is the primary host plant (Neog et al., 2005). These plants are distributed in the northeastern part of India, such as Assam, Meghalaya, Arunachal Pradesh, Mizoram, Tripura, Nagaland Manipur, and some parts of the West Bengal (Koch Bihar District) (Borgohain, 2015). Host plants play an important role in the growth and development of the silkworm and production of good quality of raw silk. That's why is very much needed to control the infestation of insect pest in the silkworm host plants (Singh et al., 2013).

Cite this article: Baruah, J.P., & Saikia, J. (2020). Stem Borer Infestation on Muga Silkworm (*Antheraea assamensis*) Host Plants on Som (*Persea bombycina*) and Soalu (*Litsea polyantha*): A review, *Ind. J. Pure App. Biosci. 8*(5), 73-77. doi: http://dx.doi.org/10.18782/2582-2845.8265

The occurrence of disease and pest in the host plants deteriorates the quality of leaves thereby affection the silkworm health which in turn affects upon quality and quantity of end product production (Borgohain, 2015). The primary host plants of muga silkworm suffered a lot of problems due to heavy infestation by the Coleopteran and Lepidopteran stem borers. It includes *Bactocera titana*, *Bactotera rufomaculata*, *Xylotrichus sp.*, Carpenter moth (*Zeuzera multistrigata*) (Singh et al., 2013). All these species having the capability to make the holes into plant parts and slowly destroy the tissues. Generally, grubs are affecting the xylem and phloem tissue of the silkworm host plants. The pest of the larvae is feeding the bark of the tree and burrows into the stem. As a result, the wood of the plant becomes weak, that's why the main trunk of the tree breaks and finally die (Sahu et al., 2007). It is very difficult to identify the first step of the borer affection in the silkworm host plants. Most of the time, they completed their life cycle inside the tunnel. The symptoms can identify to see the sap of the plant at the entry point of the holes. It is very difficult to control this pest but we can reduce the affection percentage by spraying the insecticides before the insect tunnels into the plant (Sahu et al., 2008).

(A) *Bacterocera rufomaculata*

It is one of the major pests of muga silkworm host plants. It is also known as Durian back borer or red-spotted longhorn beetle. It belongs to order Coleoptera and family Cerambycidae. *Bacterocera rufomaculata* is polyphagous in nature (Singh et al., 2013). The adult beetle emerges in July -August. Egg-laying starts from July- August. The fecundity of females ranges from 150-200. Eggs laid by an adult is white in colour, oval in shape measuring about 5-7 mm in length. Hatching of eggs takes place within 10-15 days (Upadhyay et al., 2013). Grubs after hatching are creamy in colour and initially feed under the bark and then make a tunnel to go inside the sapwood of the trunk. The grub lives for about one year. They undergo hibernation in winter inside the shoot /stem. On commencement of favorable condition when the temperature rises grubs become active and pupate inside the stem or shoots (Sahu et al., 2007). The emergence of adult occurs in May-June and come out through the tunnel. The adult beetles are brownish in colour, 3-5cm in length having a long antenna (Singh & Thangavelu, 1994).

They are voracious feeders. The grub enters the shoot by making holes and bores inside it creating a large tunnel of about 2-3cm (Singh & Thangavelu, 1994). Therefore affect the sap flow movement and affect the foliage of the plant at early stages. It leads to wilting of shoots and finally, the plant dies. The adult is large enough and therefore it requires a girth size of 6-7cm diameter to come out easily. Therefore, the infestation of the pest is usually prevalent in older plants (Saikia, 1998).

Control measures

- As the stem borer feeds internally, therefore it is difficult to control. Proper field sanitation is necessary (Singh et al., 2013).
- Light traps can be used to attract the adult.
- Collection and destruction of eggs before hatching and dispose of them off properly (Singh *et al,* 2000).
- Removal of the alternate host plant.
- Clean the entry holes properly. Soak a cotton swab in 0.5% DDVP 76% EC (5ml/l) and used this to close the holes with mud plaster (Singh & Saratchandra, 2002).
- Damage of *Bacterocera rufomaculata* can be prevented by natural enemies as there are no satisfactory chemical controls. (Upadhyay et.al., 2013)

(B) *Bactotera titana*

Bactotera titana is one of the major stem borers of muga silkworm host plant. This species belongs to order Coleoptera and family Cerambycidae (Singh et al., 2013). Bactotera titana is available throughout the year but it is very less, the peak period of these insects is July to September. The mated female laying in the eggs in cracks or on the bark of the plant. The hatching eggs transform into grub and they start feeding on the bark (Sahu et al.,

2007). Grubs are measures about 2.5 to 4.0 cm in length. It requires 5 to 6 months to complete the whole development of the grub. They passed winter as a grub and they start feeding in Spring when the weather becomes warm. They are making a hole through the wood in the tree and it's around 2 to 3 cm in diameter, borers are cutting out large galleries (Saikia, 1998). Fully grown larvae made large pupating chambers in the tree and larvae length around 5.0 cm. During pupation from starting to ending time, they stay in the chamber for 2 to 3 months. Bactotera titana, these species are greenish-yellow beetle in colour with black markings and they have orange spots. The length of the adult beetle is 5.5 cm to 7.5 cm (Singh et al., 2013). This insect completes the whole life cycle in one year and univoltine in nature. Affected trees have more burrows and entrance of the hole generally packed with wood fibers. As well as the bark of trees become colourless and wet. Slowly slowly, they are covering and making big burrows in the whole tree and as a result, the wood of the tree becomes weak, then the main trunk or branches of the tree break (Singh and Thangavelu, 1994).

Control measures

- Field sanitation is necessary (Sarmah et al., 2005).
- Collect the grubs, beetles from the affected plant, and destroy them.
- We should soak the cotton in Dimethoate (0.03%) and insert it into holes in the tree (Singh and Saratchandra, 2002).
- After inserting the soaked cotton in the holes seal properly with mud plaster.
- Light traps can be used to attract the adult.
- We should apply lime below the portion of the tree.
- Nuan (1.5%) can be used (Sahu et al., 2008).

(C) *Xylotrichus sp.*

It is one of the other major stem borers of muga silkworm host plants. *Xylotrichus sp.* belongs to order Coleoptera and family Cerambycidae. (Singh *et al.,* 2013). They are univoltine in nature and they complete the whole life cycle within one year. The mated female laying about 100 eggs in crevices of the bark of the stem and oviposition complete within 3 to 4 weeks. They completed the incubation period is about 8 to 10 days (Saikia, 1998). The fully-grown larvae make the holes in the stem and they pupate inside the tunnel. This insect completes the larval period in 9 months and the pupation period is about 28 to 30 days. Generally, in this species larvae are dangerous for bore into the stem, as a result, wilt, and branches break easily. They are preferring mostly young som plants, heavily infested and killed the tree (Sahu *et al.,* 2007).

Control measures

- Cultural practices should be followed in the plantation area (Das, 2014).
- Larvae should collect from the affected plant and destroyed them.
- Integrated pest management (IPM) steps have been taken for controlling this insect attack in som plants (Singh & Thangavelu, 1994).
- Cotton should be soaked in 0.05% monocrotophos and then insert into holes.
- After inserting the soaked cotton in the holes seal properly with mud and as well as wrapping with a polythene sheet.
- Chemical (Nuan, 1.5%) can be used (Singh & Saratchandra, 2002).

(D) Carpenter moth (*Zeuzera multistrigata*)

Zeuzera multistrigata is one of the other pests of host plants. This species belongs to the order Lepidoptera and family Zeuzeridae (Singh *et al.,* 2013). *Z. Multistrigata* widely distributed in Asian countries. The adult moth has three pairs of blue-white spots on the thorax and seven black bands across the abdomen (Beeding *et al.,* 1993). The wings are white having the wingspan of 85mm in females and 65 mm in males. The head and antennae are black in colour (Sahu *et al.,* 2007). The female moth lay eggs beneath bark or around a tunnel. After hatching the larvae feeds within the tree trunk. The larva of *Z. multistrigata* is white in colour, the head is black having dark spots on it (John *et al.,* 2000). They are univoltine in nature. The larvae have many instars and they can migrate between trees many times. Therefore, even a small population of the insect can damage to a great extent. The larva has feeding preferences; the early instars feed on the

phloem and the later instars feed on the hardwood (Singh & Thangavelu, 1994).

Control measures

- Control of these borers is very difficult as they feed on inside and it is not easily distinguishable from outside the plant (Singh et al., 2013)
- Keep the field neat and clean and maintain proper sanitation facility.
- Collection and destruction of eggs before hatching (Singh et al., 2000).
- A very effective method for controlling these borers is the use of entomopathogenic nematodes (EPNs) and have been found highly successful (Yang et al., 1993).

CONCLUSION

Muga silkworm, *Antheraea assamensis* Helfer is endemic species to Assam and as well as some parts of northeastern India. They naturally produce golden yellow colour silk. It has a high demand in the sericulture industry. Environment and good agro-climatic condition, good quality, and healthy seed, healthy host plants are the primary elements for completing one successful life cycle of muga silkworm. Among these, host plants play a very vital role in the improvement of the silkworm larvae. But, recent research concluded that different insect pest is the main problem for muga silkworm cultivation due to heavy affection of host plants. Stem borer is one of the serious insects among all these insect pests. One healthy food plant having great advantages for the development of the sericulture industry. That's why controlling insect pests by applying scientific methods is very much needed for the protection of muga silkworm host plants.

Acknowledgment

First of all, I would like to express my deepest thanks to Dr. Debajit Borah for his constant guidance throughout the research work and this research work would not have been possible without his timely suggestions despite his busy schedule. I am grateful to assistant professor Aparupa Borgohain for guidance and their extended help. Finally, to my heart full gratitude my loving friends Bhairab Das, Himshikhar Deka, and Chinmoyee Kalita for the moral support and encouragement throughout the research work.

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