

## Sthenias grisator, a “Stem girdler beetle” boring pest, damages mulberry tree

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### Abstract

*Sthenias grisator*, often known as the stem girdler beetle, is a polyphagous insect pest of the Cerambycidae family in the order Coleoptera. Although widely recognized as a key grape pest, it also attacks mulberry plants, causing minor to moderate damage in most cases, but in some regions, such as India, it can cause substantial damage. During April and May of each year, a severe outbreak of this bug occurred in the mulberry plantation belonging to the Department of Entomology, College of Eastern Uttar Pradesh, India. The female beetle harms by girdling young, delicate tips and depositing individual whitish, spindle-shaped eggs slanted into the damaged tissue. Both girdling and egg-laying cause physical damage, interfering with nutrient movement and causing the shoot section above the girdle to wither and eventually dry out. Field investigations revealed that around 10% of the plants had these distinctive drooping and dried terminal branches. Plants found around field margins, shaded by towering trees, were more seriously affected, with infestation rates ranging from 25% to 30%. Effective control was accomplished by quickly pruning and removing the damaged shoot portions just below the girdled area ideally done before eggs hatched or the upper shoot completely dried. This study provides useful information on the pest's biology, seasonal behavior, the nature and extent of damage, and practical control measures for stem-boring insects in mulberry farming.

**Keywords:** Mulberry, sericulture, *sthenias grisator*, stem girdler beetle and boring pest

### Introduction

A major polyphagous pest impacting a variety of horticultural and plantation crops is *Sthenias grisator* (Fabricius), also known as the mulberry girdler or stem girdler. Infestations have been particularly devastating in mulberry (*Morus alba* L.) plantations, which are essential to sericulture, and have been documented widely throughout India, notably in the southern areas. First categorized as a pest of coffee, citrus, and numerous fruit trees, this beetle which belongs to the order Coleoptera and family Cerambycidae has gradually become a major threat to mulberry farming, resulting in significant declines in leaf production (Shree, M. P. *et al.*, 1989)<sup>[19]</sup>. About half an inch long, the adult beetles are brown or gray with long antennae and are often attracted to light sources during their nighttime activity. They harm young mulberry stems by girdling, which involves chewing through the bark and underlying wood, which can cause the leaves above the wounded area to die (Anonymous, 1990)<sup>[1]</sup>. In these girdled areas, female beetles lay their eggs, and when the larvae hatch, they burrow into the wood, interfering with the plant's vascular system and reducing its photosynthetic output. With insect pests being one of the most persistent challenges, agricultural systems, such as mulberry farming, are inherently susceptible to biotic and abiotic stresses. In eastern Uttar Pradesh alone, more than 85 insect species have been identified on mulberry. At the worldwide level, 459 species of insects are known to infest different regions of the plant from a variety of orders, including Hemiptera (116 species), Lepidoptera (106 species), and Coleoptera (134 species). In addition, 41 mite species and 113 nematode species have been identified as pests, as well as 40 vertebrate species, including birds, bats, rodents, and mollusks, some of which

cause significant harm. More than 100 pest species have been reported in India alone (Rangaswamy, G. *et al.*, 1976)<sup>[2]</sup>, and altogether, some 653 pest species infest mulberry in grape-growing areas around the globe. Only 15–20 of the 132 insect species that infest mulberry around the world and the 100 insect and mite species that do so in India are deemed economically important (Arora, PK. *et al.*, 2005)<sup>[3]</sup>. Depending on agronomic practices including pruning, training systems, irrigation, nutrient management, berry thinning, and harvest time, pest-related losses in mulberry in India may be as high as 80%. Climate is also crucial, as abrupt environmental changes brought about by current climatic variability are likely to have a greater impact on pest populations and their natural enemies than slow climate change. Additionally, increasing CO<sub>2</sub> concentrations, rising temperatures, and changing rainfall patterns add more complexity to plant-herbivore-predator interactions, making it harder to predict or understand.

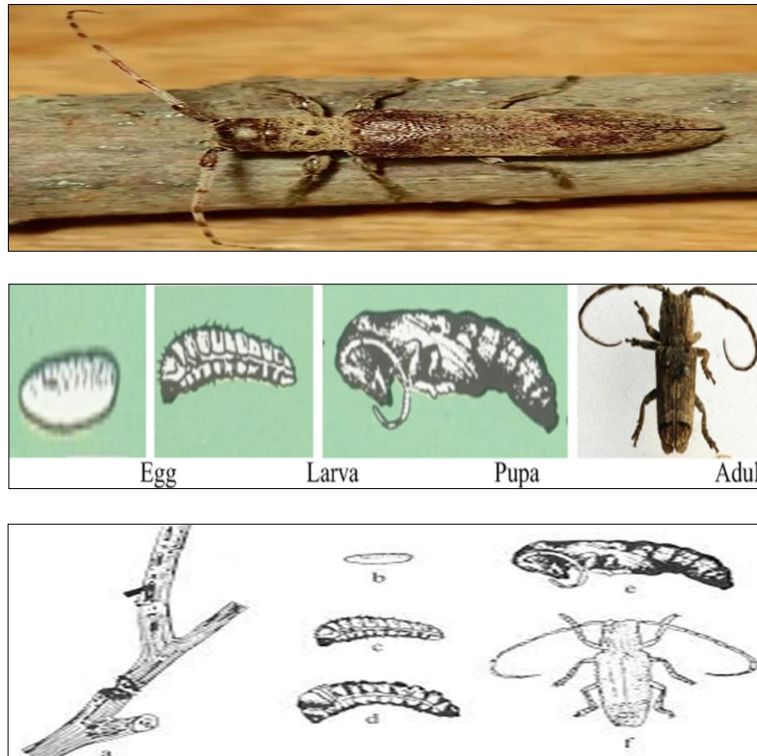
Because of these challenges, this study concentrates on evaluating the pest dynamics and population size in mulberry orchards throughout eastern Uttar Pradesh, as well as documenting their relative severity. Left uncontrolled, *Sthenias grisator* voracious feeding behavior significantly lowers leaf quality, which has a negative impact on silkworm growth and development, ultimately harming silk quality and overall productivity a major issue for sericulture in the area.

### Life Cycle of Stem girdler beetle

The adult insect is a strong, extended corn beetle with highly developed mouthparts. Females lay their eggs under the bark of girdled branches, mainly at night. Eggs hatch in around eight days. When the larvae emerge, they tunnel into

the dying branches and begin eating. They eventually develop into pre-pupae before pupating within the tunnels that they have built. The whole life cycle lasts between 7 and 8 months. The beetle's habit of girdling cutting through the bark and wood in a perfect circle around the major stem or branch, producing a clearly defined groove is a unique indication of infestation. The tissue above the girdle gradually degrades and dies,

resulting in noticeable dieback of branches or entire plants in afflicted gardens. This bug is active all year. Control methods include trimming and burning infected stems and branches. In addition, treating the base of the major stem or afflicted branches with a 0.1% BHC (benzene hexachloride) solution or a 0.1% malathion emulsion helps control the beetle, with safe harvesting times of 11 and 13 days, respectively.



**Fig :** Above Figure shows *Sthenias grisator* stem borer beetle life stages. (Ref-All Photographs viewed from Google site)

The life of a *Sthenias grisator* adult beetles are thick-bodied, long-corn beetles that are usually grey-brown in color with white stripes and creamy patches. It is nocturnal, feeding on the bark of new shoots. Oviposition: The female beetle cuts a distinctive circle around the bark of delicate shoots and then deposits a single, whitish, spindle-shaped egg into the flesh. Larva (Grub): The egg hatches in approximately eight days. The larva burrows into the branch, feeding on the interior woody tissues and producing frass. The larva develops into a pre-pupa and pupa within the tunnel. Life cycle of a beetle The life cycle can last anywhere from seven to eight months or up to two years, with peak activity occurring in April-May.

**Economic Damage of Mulberry**

Depending on regional agro-climatic circumstances, infestations of the *Sthenias grisator* stem borer beetle in mulberry plants used for sericulture are often at their worst between July and October. Due to the significant harm this pest causes to the quantity and quality of mulberry crops, it has grown in importance in recent years. The vascular system of the plant is immediately jeopardized by the larvae feeding internally on the stem tissues. Shortly after hatching, this feeding might result in total crop loss or yield declines of more than 50%, leaving only a thin outer layer intact, as it disrupts the flow of water and nutrients and compromises structural integrity. The larvae create delicate,

silky threads as they eat which cover them and capture waste. This, in turn, encourages fungal development and changes the leaf's biochemical makeup, particularly its photosynthetic pigments, making the leaves unpalatable for silkworm feeding (Zaman, A. *et al.*, 2017) [21]. Silkworm raising is adversely impacted by the ensuing drop in leaf quality, especially in the fall. Such damage directly lowers production since the availability of high-quality mulberry leaves is essential for effective silk manufacturing. Areas of a plantation that are visibly damaged by the pest are easily identifiable because it not only harms stems but also depletes vital nutrients and inhibits the overall development of the plant (Babu, TR. *et al.*, 1987) [5]. The majority of damage is caused by the larvae stage, especially by the fourth and fifth instar larvae, which feed on the green parenchyma from within and tie leaves with silk, resulting in gradual skeletonization. Infested leaves exhibit significant deficiencies in moisture, chlorophyll, proteins, sugars, and bioactive molecules, and they are frequently coated with dark or white fungal colonies. Examples of significant harm are: Girdling: Female beetles sever wood and bark tissue by creating a circular groove around the stem. Withering: The shoot portion above the girdle wilts, droops, and eventually dries out as a result of the disruption of vascular tissues (phloem and xylem). Branch Death in extreme situations, whole branches or young plants may die, severely limiting the leaf supply necessary for raising silkworms.

### Management Practices in Sericulture

Effective control of the stem girdler in mulberry orchards demands an integrated management approach. Proper pest identification is essential: Adults are medium-sized (10–15 mm), grayish-brown, with a slightly flattened body and a distinctive white spot near the center of each wing cover. Their antennae are bent and serrated. Larvae are white, legless, and C-shaped, featuring a brown head capsule and strong mandibles adapted for chewing through wood. Eggs are oval, pearly white, and lay singly or in small groups beneath the bark of mulberry fruits and young leaves.

#### Control measures include

- 1. Mechanical Control:** Infested shoot tips should be cut 2–3 cm below the girdled area and destroyed either by burning or submerging in a 0.5% soap solution to eliminate developing larvae.
- 2. Field Sanitation:** Prompt removal and destruction of infected branches help prevent further infestation.
- 3. Chemical Control (Used Cautiously):** Applying 0.1% BHC (Benzene Hexachloride) or 0.1% Malathion emulsion to the base of main stems and branches can repel adult beetles.
- 4. Injection Treatment:** For severe infestations involving extensive boring, injecting 0.2% Dichlorvos (DDVP) into the tunnels and sealing them with clay proves effective.
- 5. Critical Precaution:** Since mulberry leaves feed silkworms, any chemical use must respect the required safety interval the time needed for residues to break down before leaves are safe for consumption.

Additionally, stripping loose bark and applying a paste made from Copper Oxychloride and Carbaryl 50% WP after pruning helps expose and kill hidden beetles. Spraying Carbaryl (0.15%) or Quinalphos (0.05%) starting four days post-pruning, at 3- to 5-day intervals until new leaves emerge, effectively protects emerging buds. Evening applications are recommended for optimal results.

#### Environmental favorable factors for pests/Diseases

**Temperature:** Adult stem girdlers flourish in warm climates, with optimal development and reproduction temperatures ranging from 20–30°C (68–86°F).

**Humidity:** Increased humidity encourages fungal development in the beetle's boreholes, which may weaken the vine while also providing additional sustenance for developing larvae.

**Signs of infestation:** Mulberry tree girdling can cause wilting and dieback of foliage above the girdled area, noticeable bark cracks, sawdust-like detritus collecting at the base of the tree, and tiny entry holes in the wood. The culprit, *Sthenias grisator*, is a longhorn beetle from the Cerambycidae family, belonging to the order Coleoptera, class Insecta.

### Effective control methods for *Paracoccus marginatus* include

1. physically removing larvae by hand.
2. Dewing, followed by heavy ploughing to destroy dormant larval stages.
3. During September and October, burn any contaminated or fallen leaves.
4. Wrapping tree trunks with straw bands to capture pests.
5. Use light traps to capture adult moths.
6. Spraying mulberry plants with 0.04% DDVP, which can suppress infestation by 80–90%.
7. Using parasitoids, which are similar to those that attack *Apanteles* species, as biocontrol agents.
8. To prune and destroy diseased branches and leaves as soon as possible following the outbreak. It is critical to burn all crop trash in afflicted gardens that house mealybug colonies.
9. Using high-pressure water jets to physically eliminate bugs from plant surfaces, which helps to keep a mealy bug-free mulberry plantation.

### Result and Discussion

Atwal, A. S. *et al.* (1997) [4] discovered a variety of mulberry pests, including sucking insects like mealybugs, thrips, and hoppers, as well as beetle pests like flea beetles, stem borers, chafer beetles, stem girdlers, shot hole borers, and many lepidopteran species and mites. These findings are consistent with those of the current study. The current findings are consistent with earlier reports by Heldt, H. W. (1997) [12] and Gupta, R. *et al.* (2018) [11], who described 22 insect pests infesting grapevines in northern Karnataka. In a similar vein, Biradar, A. P. *et al.* (2018) [10] and Bindra, O. S. *et al.* (1973) [9] identified 12 pest species infesting grapes in Vijayapura, which consisted of two Lepidoptera species, two Coleoptera species, one Acari species, three Thysanoptera species, and four Homoptera species. The stem girdler, the stem borer, three mite species, and three thrips species were the eight pest species found to be of greatest concern in this investigation. Previously, Batra, R. C. *et al.* (1992) [8] classified two of the 22 pests in northern Karnataka, the flea beetle (*Sceledonta strigicollis* Mots. ) and mealybug (*Maconellicoccus hirsutus* Green), as major pests, while identifying three others—the stem girdler (*Sthenias grisator* Fab.), stem borer (*Coelostema scabrator* F. ), and leaf worm (*Spodoptera litura* Fab.) as moderate pests, with four thought to be insignificant and thirteen to be minor. The current findings on the severity of pests are somewhat consistent with those of Balaikai, R. A. (1999) [6], who also identified *C. scabrator* as a significant grape pest. Kali, S., *et al.* (2014) identified over 100 insect pests of grapes in India, whereas Balaikai, R. A., *et al.* (1999) [6] described over 85. In line with the current results, Mathur, R. M. *et al.* (2014) [18] identified thrips, mealybugs, stem borers, mites, flea beetles, and caterpillars that feed on leaves and bunches as important grape pests. While Mahadevan, A. *et al.* (2000) [16] reported six mite species *Tetranychus urticae*, *T. cinnabarinus*, *T. neocaledonicus*, *Oligonychus mangiferus*, *O. unicae*, and *Eutetranychus orientalis*—damaging grapevines throughout India, this study only identified two mite species. The two-spotted red spider mite (*T. urticae*) is one of the most destructive pests

in Maharashtra, Karnataka, and Andhra Pradesh (Mahadevan, A. *et al.*, 1982) [17]. Many variables, such as climate and soil differences, rootstock types, natural enemies, altitude, geographic isolation, agricultural techniques, and pest management practices, affect how grape pests are distributed (Mahadevan, A., 2012; Veeranna, G., 1997) [15, 20]. It's important to comprehend the effects of stem borers and other pests because mulberry leaves are a necessary component of sericulture, and these pests can have a major impact on the yield and quality of leaves used to feed silkworms.

### Conclusion

To summarize, this chapter emphasizes the severe risks that invasive insect pests provide to native insect populations, especially through their interactions with native pests and natural predators. A significant problem is predicting and preventing the spread of invasive bug species, which can outcompete or destroy local kinds. The increasing practice of farming edible insects, which sometimes involves exotic pest species, adds to the hazards due to unintentional escapes and the transmission of illnesses into surrounding ecosystems. However, even ostensibly harmless control tactics, such as the Sterile Insect Technique, are reviewed for potential environmental consequences. When it comes to pest management, society and lawmakers must make judgments based on rigorous, evidence-based science. Current events highlight the vital need of accessible research to inform sound and responsible decision-making. Maintaining high-quality greenery by controlling stem borer infestations is critical to sericulture since it directly affects silk production and the industry's sustainability, particularly for Muga and Tasar silk, which are extremely sensitive to host plants such as Som and Asan. A successful defense necessitates an integrated pest management (IPM) strategy that includes cultural, biological, and chemical treatments. This approach efficiently targets pests that attack the stem while preserving host plants for silkworm use.

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