



POPULAR SCIENCE ARTICLE

Understanding Small Hive Beetle Biology and Strategies for its Prevention and Management

Nawazish Ahmad^{1*}, Vivek Kumar¹, Ramanuj Vishwakarma¹, Md Jawed Alam² and Rishabh Kumar³¹Department of Entomology, Bihar Agricultural University, Sabour-813210, Bhagalpur, Bihar.²Department of Plant Pathology, Bihar Agricultural University, Sabour-813210, Bhagalpur, Bihar.³Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa-848125, Samastipur, Bihar, India*Email: nawazishahmad1801@gmail.com

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Abstract

The small hive beetle (SHB), *Aethina tumida* Murray, is a generalist pest native to sub-Saharan Africa that has spread to several regions worldwide, including America, Australia, Europe and Asia. Its larvae and adults feed on honey, pollen, comb and brood, causing honey fermentation, comb damage and, under heavy infestation, colony weakening or abandonment. This popular article briefly discusses the biology, distribution, pest status, diagnosis, prevention and integrated management of SHB, with emphasis on biological control. Maintaining strong colonies, hive sanitation, regular monitoring, trapping, soil management and suitable biological control agents can help reduce SHB populations sustainably.

Key words: Honey bee, small hive beetle, management, life cycle, biology

Introduction

Honey bees are among the most important beneficial insects in agriculture. In addition to providing honey and other hive products, they play a crucial role as pollinators of numerous fruit, vegetable, oilseed, and seed crops, thereby contributing substantially to agricultural productivity. With the expansion of apiculture and the movement of honey bee colonies, queen bees, and hive products across different regions and countries, several insect pests associated with honey bees can also be inadvertently introduced into new areas. Among these, the small hive beetle (SHB), *Aethina tumida* Murray (Coleoptera: Nitidulidae), is an important insect pest associated with honey bee colonies. It is native to sub-Saharan Africa, where it naturally occurs in association with African honey bees. (Neumann and Elzen, 2004; Ellis and Hepburn, 2006). In its native range, SHB generally acts as a scavenger and feeds on hive materials such as pollen, honey, and bee brood. Strong African honey bee colonies can substantially restrict the development and population growth of SHB through effective defensive and hygienic behaviours. The presence and infestation of SHB have also been reported in India. In September 2022, its first occurrence in *Apis mellifera* colonies was reported from North 24 Parganas district of West Bengal, where infestation levels ranging from 8–98% were recorded at some

locations, along with large numbers of adult beetles and larvae (Kumaranag *et al.*, 2026). These observations highlight the importance of early detection, regular monitoring, and timely management of SHB in Indian apiculture. From an entomological and integrated pest management perspective, regular inspection of

colonies, maintenance of strong and healthy bee populations, proper hive sanitation, and removal of unnecessary or unused hive resources can help suppress SHB development and population buildup. Since the mature larvae leave the hive and enter the soil to pupate, effective management should not be restricted to the hive environment but should also include the surrounding apiary soil and habitat. Therefore, sustainable management of SHB requires an integrated approach involving early detection, cultural and mechanical practices, biological control, and evaluation of suitable plant-based management options. Development and adoption of scientifically validated management strategies can help reduce SHB infestation while conserving honey bee colonies and protecting their essential pollination services.

Getting to Know the Small Hive Beetle

The small hive beetle (*Aethina tumida*) is a small, dark brown to black, oval-shaped that are approximately 1/3 the length of an adult bee

and have club-like antennae, belonging to the family Nitidulidae. Adults are generally measure about 5-7 mm in length. They are active fliers and can move between colonies, helping the pest spread within and between apiaries. While able to live outside the hive feeding on rotting fruit, SHBs prefer the rewards of life inside a honey bee colony. Adults are drawn to the smell of pollen, nectar, and alarm pheromone, and are able produce a yeast on their bodies that, when combined with pollen, produce the same smell as an alarm pheromone. This adaptation attracts other SHBs to the hive.



Fig. 1. Adult Small Hive Beetle (Photo credit: University of Florida)

From Egg to Adult: Understanding the Life Cycle

Egg → Larva → Pupa → Adult

An important feature of its life cycle is that development occurs in two different environments. The egg and larval stages are mainly associated with the bee colony, whereas the pupal stage occurs in the soil around the hive.

1. Egg - The Beginning of the New Generation

After becoming sexually mature, female beetles enter suitable honey bee colonies and lay eggs in protected locations. They may deposit eggs in cracks, crevices and other sheltered areas of the hive. When worker bees are unable to prevent them, females may also lay eggs near brood and pollen resources. A female can produce a large number of eggs during her lifetime. The eggs are small, pearly white and are generally laid in clusters. Under favourable conditions, eggs may hatch in approximately 2-6 days. For the beekeeper, this stage is difficult to detect because eggs are often hidden from view.



Fig. 2. Hive beetle egg clusters in a pollen cell

2. Larva - The Main Damaging Stage

After hatching, the creamy-white larvae begin feeding inside the colony. They mainly utilize honey and pollen and may also feed on other colony materials.

As larvae increase in number, they can crawl over combs and damage stored resources. Heavy infestations may cause honey to leak from damaged combs. The honey can become contaminated and may ferment, producing an unpleasant smell. The larval stage is therefore particularly important from a pest-management point of view. After approximately 10-14 days, larvae will migrate out of the hive and burrow into the soil to pupate. These "wandering larvae" are able to travel great distances to find suitable soil. After 21-35 days, adult SHB will emerge after pupation to seek a new colony to begin the cycle again. Populations of SHB often peak in mid to late summer and are lowest during the winter.

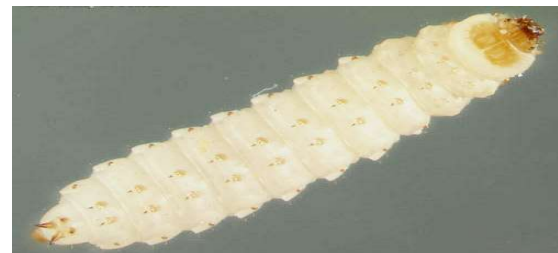


Fig. 3. Small Hive Beetle larva (Photo credit: University of Florida)

3. Pupa - The Hidden Stage in Soil

After leaving the hive, mature larvae burrow into the soil and form a pupal cell. The pupal stage is especially important because it occurs outside the hive. Soil conditions can strongly influence successful pupation. Soil moisture, temperature, density and other environmental conditions affect development and survival. Most larvae generally pupate in the upper layer of soil, commonly within about 10 cm of the soil surface. Moist, loose soil can provide suitable conditions for development, whereas unfavourable soil conditions can reduce pupation success. This explains why the soil surrounding an apiary should not be ignored when considering small hive beetle management.



Fig. 4. Pupa of a small hive beetle

4. Adult - The Beetle Returns to the Hive

After completing pupation, young adults emerge from the soil. They become sexually mature after approximately one week and begin searching for suitable honey bee colonies. Adults are strong fliers and can move between colonies. They are attracted by odours associated with honey bee colonies and their stored resources. Once inside a suitable colony, females begin laying eggs and the cycle starts again.

Why Can Small Hive Beetle Become a Serious Problem?

Finding a few small hive beetles in a strong honey bee colony does not always mean serious damage. Healthy colonies can defend themselves by chasing, confining and restricting the beetles. However, the situation can change when the colony is weak, beetle numbers increase, or weather conditions favour rapid beetle development. The larval stage causes much of the direct damage. Larvae feed on honey, pollen and other hive resources while moving through the combs. Their feeding and movement can damage combs and cause honey to leak out. The honey may become contaminated and begin to ferment, producing an unpleasant smell. In heavy infestations, the colony can become severely disturbed and may abandon affected portions of the hive. In extreme cases, the entire colony may abscond. Thus, the real problem is not simply the presence of an adult beetle. The greater concern is the uncontrolled development of a large beetle population inside a vulnerable honey bee colony.



Fig. 5. Honey comb showing fermenting honey and other damage caused by larvae of the small hive beetle

How Can a Beekeeper Recognize an Infestation?

Regular inspection is one of the simplest and most important tools for detecting small hive beetle.

During inspection, the beekeeper should look carefully at:

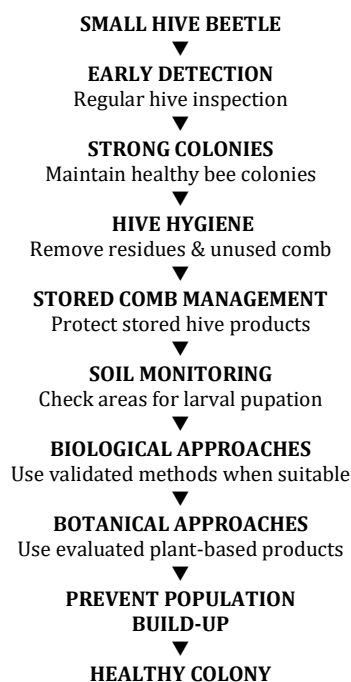
- Spaces between frames;
- Corners and cracks of the hive;
- Bottom boards;
- Combs containing honey and pollen;

- Stored or unused comb;
- Areas where beetles may hide; and
- The soil surrounding the apiary.
- Adult beetles may be seen running rapidly over the comb or hiding when exposed to light. Larvae may be found moving across combs or leaving the hive.
- Another important warning sign is fermented or unpleasant-smelling honey. Slime-like material, damaged comb and leaking honey may indicate a heavy infestation.
- Early detection is valuable because controlling a small population is generally easier than dealing with an established infestation.

Integrated Management is the Better Approach

Small hive beetle management should not depend on a single method. An integrated approach combines several compatible practices.

A beekeeper can focus on:



1. Strong Colonies: The First Line of Defence

- One of the most practical principles of small hive beetle management is to maintain strong, healthy honey bee colonies.
- Worker bees actively defend their colony and can restrict beetle movement. Strong colonies have more workers available to patrol combs and respond to intruders. In contrast, weak colonies may have more

unguarded space and resources that beetles can exploit.

- Beekeepers should therefore pay attention to colony strength, queen performance, food availability and general colony health.

A simple principle can be remembered

Strong colony + regular inspection = better protection against pest build-up.

2. Keep the Hive Clean and Well Managed

- Good apiary hygiene is another important part of pest management. Unnecessary empty comb, damaged comb, spilled honey and other hive materials can provide resources or shelter for pests.
- Beekeepers should avoid allowing unused hive materials to accumulate around the apiary. Colonies should be inspected regularly, and damaged or unnecessary materials should be managed appropriately.
- Good management does not mean that every beetle must immediately be eliminated. Instead, the goal is to prevent the pest population from reaching a level at which the colony can no longer control it.

3. Do Not Forget the Soil

The soil is an often-overlooked part of small hive beetle management.

- Unlike many common hive pests, mature small hive beetle larvae leave the colony and enter the soil to pupate. Research has shown that soil conditions can influence pupation success.
- This creates an opportunity as well as a challenge. Because the beetle's life cycle includes a soil stage, researchers have investigated approaches that target larvae or pupae outside the hive. These include certain soil-management approaches and biological control agents such as entomopathogenic nematodes.
- However, any treatment around a bee colony should be selected carefully to avoid harming honey bees and other beneficial organisms.

Small Hive Beetle and the Future of Beekeeping

The importance of small hive beetle extends beyond honey production. Honey bees are valuable pollinators, and healthy colonies

contribute to the productivity of many agricultural crops. As beekeeping expands and colonies are moved between locations, pests associated with honey bees can also be transported. The history of small hive beetle outside its native range shows why early detection, responsible movement of colonies and good apiary management are important. For regions where the beetle is absent or not widely established, awareness and monitoring are particularly important. For regions where it is present, the emphasis should be on reducing population build-up and protecting vulnerable colonies.

Conclusion

The small hive beetle may be tiny, but it should not be ignored. Its ability to hide inside colonies, reproduce using hive resources and complete its pupal stage in surrounding soil makes it a challenging pest. Fortunately, beekeepers are not helpless against it. Strong colonies, regular inspection, good sanitation, careful management of hive materials and attention to the surrounding soil can all reduce the risk of serious infestation. Biological and botanical methods may provide additional tools as research continues.

The most important message for every
beekeeper is simple:

***"Know the beetle before the beetle damages
the hive."***

Early observation and timely management can
help protect honey bee colonies, honey
production and the valuable pollination services
provided by bees.

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