

Advancements in integrated management of banana pseudostem weevil (*Odoiporus longicollis*): Addressing a key biotic constraint in banana cultivation

Rahul Nandi*, Annesha Panja

Faculty Of Agriculture, JIS University, Kolkata, West Bengal, India

Abstract

In many tropical countries, bananas are considered staple foods due to their role as a fruit crop. 102.02817 million tons of bananas are produced worldwide, with India leading the world in production with a 29.19% share (FAOSTAT-2013). Banana pseudostem weevil (BPW) (*Odoiporus longicollis* Oliver) is one of a number of insect pests that significantly reduce banana production in Asia. Many of the insecticides that were previously recommended for treating the pest were either banned, phased out, or had limited use due to various dangerous risks. Therefore, it is necessary to standardize effective insecticides and application techniques. The biology, life cycle, distribution and management of *Odoiporus longicollis* are the main topics of this review. It focuses on cultural, mechanical, biological and chemical control, and other areas of damage and management.

Keywords: Banana pseudostem weevil, biological control, banana, ipm, host preference

Introduction

India produces 40 million tonnes of fruits, with bananas coming in first. According to Visalakshi *et al.*, 1989 [7], the main factor limiting banana yield and productivity is pest ravage. *Odoiporus longicollis* Olivier, also referred to as the banana pseudostem weevil (BPW), is the most harmful monophagous weevil pest in bananas out of the three that have been documented. Many regions of India have recorded cases of BPW, and Southern India, especially Tamil Nadu and Kerala, is seeing an increase in this deadly condition.

The rotting-promoting bacteria that flourish in the damaged areas worsen the harm done to the banana plants. Every stage of the borer's life cycle can be visualized throughout the year. This weevil is estimated to crop losses up to 10–90%, depending on the level of infestation. Thus, by carefully analyzing the biology and occurrence patterns of the pseudostem weevil in bananas. Also, the review aims to

learn which types of bananas are susceptible and which types of bananas are resistant to *O. longicollis*. With these efforts, the study aims to provide useful information that would serve as a crucial foundation for the development of workable management strategies that would mitigate the pest's detrimental effects on banana growing.

Biology

Although the banana pseudostem weevil and the rhizome weevil are superficially similar, the former is somewhat larger and its elytra do not fully cover the abdomen. The BPW exhibited clear sexual dimorphism, classifying the smaller, black weevils as males and the larger, reddish-brown ones as females. However, the observations identified the larger weevils as males and the smaller, black ones as females. The color variation is just a feature of sympatry and non-sex limited variation and cannot be connected to sexual dimorphism (Krishnan *et al.*, 2015) [4].



Source: ICAR- NRCB

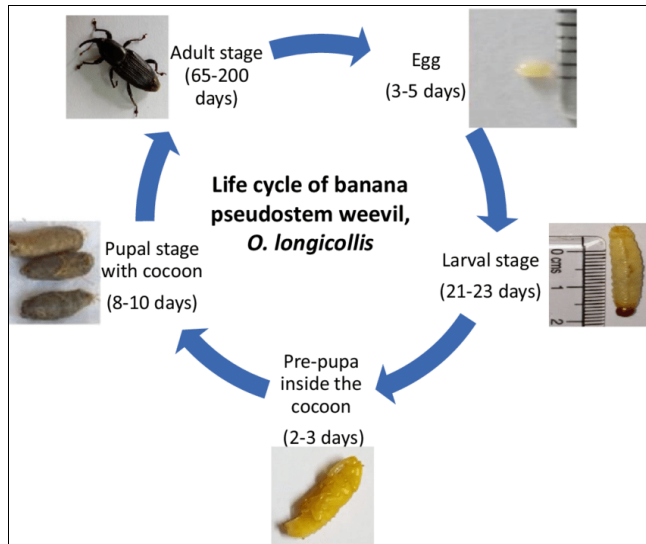
Fig 1: Banana pseudostem weevil larvae(left) and adult(right)

Life Cycle

It is estimated that the BPW has a pre-oviposition phase of 15–30 days. After a single mating, females typically produce nine eggs and a single female may lay anywhere from 15 to 21 eggs in a single season. The duration of

incubation ranges from three to five days in June through August and from five to eight days in December through February. The larvae of the weevil are sluggish, apodus, leathery, soft, fleshy, creamy white, sub-cylindrical, active and red headed with biting and chewing type mouth parts.

The body of the larvae is covered with sparse brownish setae of different lengths and the mandibles the head holds are bi-dentate, strong and dark brown. The width of the head capsule increases in successive geometrical progression. Measurement of the width of the head capsules of the larvae at different instars was found to be 0.874 mm in summer and 0.819 in winter (Krishnan *et al.*, 2015) [4].



Source: Kannan *et al.*, 2021

Fig 2: Illustration picture of banana pseudostem weevil life cycle

Distribution

It has been shown that the pest prefers high humidity and tropical climates. According to (Palanichamy, 2011) [6], Tamil Nadu has the highest weevil density of any state. The initial reports on the prevalence of pests in various Indian states. The banana pseudo-stem weevil was thought to have evolved in the areas where bananas were thought to have originated, specifically in south and southeast Asia.

Host Preference

Numerous banana cultivars, including the popular Dwarf Cavendish, Grand Naine, and Robusta, are enjoyed by the pest. The screened banana germplasm from the Horticultural Research Station (HRS) in Anantharajupet, Andhra Pradesh, and the National Bureau of Plant Genetic Resources (NBPGR) Regional station in Kerala. They classified the following varieties as resistant to BPW infestation, but they are not preferred for consumption, with the exception of Rasakathali and Njalipoovan. Additionally, they noticed that the number of weevils increased from 5.5% in 1999 to 21.36% by 2000. According to many researchers the Nendran variety has the highest prevalence of BPW (93.3%), followed by Poovan (80%), Robusta (66.7%), and Kappa (60%) (Krishnan *et al.*, 2015) [4].

Damage Symptoms

Monitoring the pest in the field is an important activity for commercial and smallholder banana production. Field infestation by the weevil can be monitored with the following symptoms on the banana pseudostem (Kannan *et al.*, 2022) [2].

1. The pseudostem's pinhead-sized hole signifies oviposition.
2. Fibrous extrusions from the bases of leaf petioles indicate adult entry into the pseudostem.

3. The exudation of a jelly-like substance (mucilaginous water soluble polysaccharides) from the holes on the pseudostem indicates damage from larval feeding.
4. The yellowing of leaves and decay of peduncles as a result of insufficient nutrient supply through the central stem damaged by larval feeding. The symptoms listed above show that weevil attacks are common in the garden.



Source: ICAR-NRCB

Fig 3: Illustration picture of banana pseudostem weevil damage symptom

Integrated Pest Management

Integrated Pest Management (IPM) is a sustainable approach to managing pests that combines cultural, mechanical, biological and chemical tools. Here are some IPM strategies for managing pseudostem weevils:

■ Cultural Control

1. Remove old and dead leaves and practice clean cultivation.
2. Balance dose of fertilizer and free from weeds at all times.
3. The growing of resistant Musa cultivars only can provide a long-term solution for BPW management.
4. Due to the banana weevil's ability to survive in banana plant leftovers, the harvested pseudostem must be promptly removed, chopped into tiny pieces, and buried deep in the ground after harvest (Hemadri *et al.*, 2025) [1].

■ Mechanical Control

1. Pseudostem traps usage is important for monitoring, mass collection, destruction of adults and preventing the weevil multiplication.
2. Use of pheromone trap @25traps/ha to destroy the weevil population.
3. The combination traps of LED+LSBP have attracted a greater number of adult *O. longicollis*.

■ Biological Control

1. The use of *Beauveria bassiana*, isolated from *Odoiporus longicollis* cadavers showed a reduction of pseudostem weevil damage up to >50% in a screen house experiment (Padmanaban *et al.*, 2009) [5].
2. *Steinermia sp.* and *Heterorhabditis indica* (1×10^8 spores/mg) keep the split traps near the banana plant facing cut surface to soil.
3. The natural predators of the beetle include *Chrysopilus ferruginosus* and *Plaesius javanus*.
4. Application of entomopathogenic nematode *H. bacteriophora* @ 4 cadaver plant⁻¹ in leaf axils at 5, 6,7 and if required at 8 months after planting was advised by KAU (2016) [3].

5. The mites of *Uropoda* spp. were found to disturb the physiological activity of BPW (Kannan *et al.*, 2022) [2].

▪ Chemical Control

1. Cut the banana plant after harvest at the ground level and treat it with carbaryl (1g/litre) or chlorpyrifos (2.5ml/litre) at the cut surface.
2. Fumigation of banana plants using Celphos(Aluminium phosphide tablets), especially during the vegetative stage is phytotoxic and should be discouraged.
3. Extracts or oils from *Azadiracta indica*, *Lantana camera*, *Pongamia pinnata* (Karanj), *Vitex negundo* (Notchi), *Cymbopogon* sp. (lemon grass), Neem seed kernel extract and Horticultural mineral oil were found to be repelling and insecticidal against the adult stage of *Odoiporus longicollis* under laboratory conditions.
4. The most successful treatment was Diazinon 5GR at 2 0 g per clump, which reduced the percentage of trees affected by banana weevils by 93% in six months with two applications (Hemadri *et al.*, 2025) [1].

Conclusion

In conclusion, a sustainable strategy for the long-term management of BPW in the field may involve the use of host plant traps with EPF, the application of botanical or biocontrol agents on the hot spot of the infested region, and routine monitoring with excellent cultivation practices. According to reports, *O. longicollis*'s physiological activity (flying and reproductive fitness) is disrupted by the ectoparasitic mites, making them a natural enemy. But it was necessary to prove that those mites could be successfully raised and released into the wild. More investigation is necessary on the molecular resistance of *Musa* cultivars against BPW. The Integrated Pest Management (IPM) strategy for controlling the pseudostem weevil, a significant pest of banana, involves a combination of cultural, mechanical, biological, and chemical methods.

Acknowledgement

I want to gratefully acknowledge Ms. Annesha Panja for her invaluable advice, unwavering support, and helpful recommendations throughout the writing of this review paper. Her help with content organization, manuscript review, and perceptive criticism was crucial to this work's effective conclusion. Her participation, time, and work during the writing process are greatly appreciated.

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