Volume 3, Issue 11
November I 2025

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Scientific Classification, Biology, and Management of White Grubs (*Scarabaeidae*)

ARTICLE ID: 0285

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White grubs (larvae of *Scarabaeidae* beetles) are among the most destructive soil-dwelling pests affecting a wide range of agricultural and plantation crops such as sugarcane, maize, arecanut, and groundnut. Their root-feeding behavior leads to severe yield losses and plant mortality. This review compiles scientific information on their classification, life cycle, economic importance, damage symptoms, and management strategies. Emphasis is placed on integrated pest management (IPM) approaches that combine cultural, biological, and chemical methods for sustainable control.

1. Introduction

White grubs, the larval stage of scarab beetles (Family: *Scarabaeidae*), are serious root-feeding pests found across tropical and subtropical agricultural systems. The adult beetles, commonly known as "chafer beetles" or "May–June beetles," lay eggs in the soil near crop roots. The larvae feed on underground plant parts, causing significant crop damage. In India, annual crop losses due to white grub infestations are estimated to reach several million rupees. Therefore, understanding their biology and effective control measures is essential for sustainable pest management in agriculture.

2. Scientific Classification

Taxonomic Rank	Classification
Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Coleoptera
Family	Scarabaeidae
Subfamily	Melolonthinae
Common Name	White Grub
Representative Species	*Leucopholis burmeisteri*, *Holotrichia serrata*, *Anomala bengalensis*

3. Life Cycle of White Grubs

White grubs undergo complete metamorphosis consisting of four stages: egg, larva, pupa, and adult. Adults emerge after the onset of summer rains and lay

eggs in moist soil near host plants. The eggs hatch into grubs that feed on plant roots and remain underground for several months. The larval stage is the most damaging. After feeding, the grubs pupate in the soil, and adults emerge to start the next generation. The duration of the life cycle varies with species and environmental conditions, typically ranging from 1 to 2 years.

4. Economic Importance and Host Range

White grubs attack several economically important crops such as sugarcane, maize, potato, arecanut, and groundnut. Infested fields exhibit patchy crop stands, wilting, and plant death. Yield losses may range from 10% to over 80%, depending on the infestation level. Their polyphagous nature and ability to survive on multiple hosts make management difficult, especially under continuous cropping systems.

5. Nature and Symptoms of Damage

- Wilting and yellowing of leaves due to impaired root function.
- Stunted plant growth and poor crop stand.
- Drying or sudden death of plants in patches.
- Easy uprooting of affected plants because of root pruning.
- Presence of C-shaped white larvae in soil around damaged roots.

6. Management Strategies

Effective management of white grubs requires an integrated approach that combines cultural, biological, and chemical methods.

6.1 Cultural Control

- Deep summer ploughing exposes larvae and pupae to heat and predators.
- Installation of light traps at night helps collect adult beetles.
- Crop rotation and clean cultivation minimize pest carry-over.

6.2 Biological Control

- Application of neem cake (250–500 kg/ha) helps suppress grub populations.
- Entomopathogenic fungi such as *Beauveria bassiana* and *Metarhizium anisopliae* are effective against larvae.
- Entomopathogenic nematodes (*Steinernema* spp., *Heterorhabditis* spp.) can be applied in moist soil to infect and kill grubs.

6.3 Chemical Control

- In severe infestations, soil application of chlorpyrifos (5% dust) or imidacloprid (0.05%) at planting protects young roots.
- Chemical control should be used judiciously under expert supervision to prevent resistance and minimize harm to beneficial soil organisms.

6.4 Integrated Pest Management (IPM)

- Combining monitoring, cultural practices, biological agents, and need-based chemical use provides long-term sustainable control.
- Farmer awareness and timely field monitoring are critical for successful implementation.

7. Discussion

Among available methods, biological control using entomopathogenic fungi and nematodes offers an environmentally friendly alternative to chemical insecticides. Although chemical control yields rapid results, its overuse disrupts soil ecosystems and promotes pest resistance. Hence, integrating eco-

friendly biological agents with cultural management practices is the most sustainable approach. Continued research on locally adapted biocontrol strains and farmer-oriented formulations will enhance the efficacy of IPM programs.

8. Conclusion

White grubs are major soil pests posing significant threats to agricultural productivity. Understanding their life cycle, damage mechanisms, and host preferences is essential for effective management. Integrated Pest Management—combining cultural, biological, and limited chemical interventions—provides a sustainable and environmentally sound solution for long-term control and soil health preservation.

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