IPM Strategies for Controlling Brown Planthopper, Nilaparvata lugens (Stal.) in Rice

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ABSTRACT

Rice is a vital food crop in our country, grown in various seasons and climates. However, it is susceptible to many pests, with the brown planthopper (*Nilaparvata lugens*) being one of the most damaging. Farmers often use pesticides indiscriminately to control these pests, which leads to problems like air pollution, harm to beneficial insects, pest resistance, and pest resurgence. To address these issues, comprehensive pest management practices are essential. These practices focus on reducing pesticide use and promoting sustainable farming. This guide provides key information on identifying the brown planthopper and effective management methods to help farmers protect their crops while minimizing environmental impact.

INTRODUCTION

Rice (*Oryza sativa* L.), a member of the Gramineae/Poaceae family, is one of the world's three major food crops, providing the staple diet for about half of the global population, especially in Asia, the Middle East, Latin America, and the West

Indies. Global rice production reached 514 million metric tons in 2021-22 (USDA, 2023), and in India, it covers 46.4 million hectares, producing 129 million metric tons with a productivity of 2390 kg/ha (Indiastat, 2023). Rice yields are significantly impacted by biotic and abiotic stresses, with 52% of global yield loss due to biotic factors, including 21% from insect pests (Yarasi et al., 2008). Over 1400 insect species affect rice, but only about 20 are economically significant, with planthoppers like the Brown Planthopper (*Nilaparvata lugens*), Whitebacked Planthopper (*Sogatella furcifera*) and Small brown Planthopper, *Laodelphax striatellus* causing major yield losses. Unchecked pest outbreaks can lead to complete rice crop loss if effective control measures aren't taken. Initially, insecticides were relied upon due to their effectiveness and easy application. However, their indiscriminate use caused resistance development (Gao *et al*., 1987).

Brown planthopper (*Nilaparvata lugens*)

Symptoms of damage:

The brown planthopper is a significant pest that causes damage to plants, particularly in rice crops. Both nymphs and adult hoppers tend to congregate at the base of the plant, typically above the water level. As they feed on the plant's sap, they induce a condition known as "hopper burn," where the affected plant dries up, resulting in a scorched appearance. This damage is often characterized by circular patches of drying and lodging in the matured plant, which can lead to significant yield loss. In addition to direct feeding damage, brown planthopper is a vector for several serious plant diseases, including grassy stunt, ragged stunt, and wilted stunt, all of which further weaken the plant. Another consequence of hopper infestation is the secretion of honeydew by both nymphs and adults. This sugary substance encourages the growth of sooty mould at the base of the plant, which can further impair photosynthesis and overall plant health.

Affected plant

Hopper burn

Identification of insect pest:

The Brown Planthopper can be identified at various life stages. Its eggs, laid in clusters of 2 to 12 on the leaf sheath or leaf blades, are slender, cylindrical, and translucent, covered by a dome-shaped plug. Nymphs are initially cottony white, measuring 0.6 mm, and turn purple-brown as they mature, reaching 3.0 mm by the fifth instar. Adults, measuring 4.5 to 5.0 mm, vary in color from yellowish-brown to dark brown. There are two forms: macropterous (long-winged) with fully developed wings and brachypterous (short-winged) with reduced hind wings. Both forms have a distinct tibial spur on their hind legs.

Nymphs

Adult hoppers

Comprehensive Ownership Practices for Managing Brown Planthopper

1. Cultivation of Resistant Rice Varieties

- ✓ Some resistant varieties include: RP BIO 4918-230S, BM 71, RP 2068-18-3-5, IC 70613, IC 75975, ADT 37, ADT 38, ADT 42, ASD 17, Co. 46, MDU 4, TPS 2, Pant Shankar Dhan 3, Pant Dhan 11.

2. Field Design and Maintenance

- ✓ Create 30 cm wide sidewalks spaced 2 meters apart to improve air and light circulation.
- ✓ Apply nitrogen fertilizers in recommended doses, divided into 2-3 applications.
- ✓ Coordinate planting times among farmers in the region to minimize pest buildup.

3. Crop Rotation

- ✓ Rotate rice with pulses, oilseeds, and other non-rice crops to break the pest cycle.
- ✓ Avoid consecutive rice cultivation to reduce the risk of hopper infestation.

4. Water Management

- ✓ Drain the field once during the cropping season to allow it to dry out, disrupting hopper breeding.

5. Biological Control

- ✓ Release natural enemies like *Lycosa pseudoannulata* and *Cyrtorhinus lividipennis* (200–250/ha) during peak brown plant hopper incidence at 10-day intervals. Hymenopteran wasps parasitize eggs, while mirid bugs and mites prey on both eggs and nymphs. Spiders and coccinellid beetles feed on nymphs and adults. Aquatic beetles, dragonflies, and certain bugs consume hopper nymphs and adults that fall into water. Fungal pathogens also infect the hoppers.

6. Environmental Management (Ecological Engineering)

- ✓ Grow plants like marigold, bhendi, cowpea, Sunhemp, Coriander along paddy ridges.
- ✓ These plants provide nectar and pollen, helping sustain natural predators of hoppers and other pests.

7. Chemical Control

- ✓ Chemical control for hopper infestations should be implemented when populations reach 10-15 hoppers per hill. Recommended insecticides include Triflumezopyrim (Pexalon 10% SC) at 0.5 ml per liter of water (94 ml per acre), applied once 45 to 60 days after planting. Dinotefuron 20 WG at 0.4 grams per liter of water (80 grams per acre), and Pymetrozine 50 WG at 0.6 grams per liter of water (120 grams per acre).

CONCLUSION:

The brown planthopper is a major pest in rice cultivation, causing significant damage and yield loss. Effective management combines resistant rice varieties, crop rotation, water management, biological control, and careful use of pesticides. By adopting integrated pest management practices, farmers can control the

pest while minimizing environmental impact and ensuring sustainable rice production.

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