



## Brown Planthopper (*Nilaparvata lugens* Stal) A Major Pest of Rice in India

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### INTRODUCTION

The most significant staple food in the world, including Asia and the Pacific, is rice (*Oryza sativa* L.). Due to its high calorie content and financial benefits, rice is a staple food for millions of people worldwide. Because it is easily found in stores, has a lot of calories for energy, tastes great, and produces enough when boiled, rice is quickly becoming a staple food for the majority of Indians. Rice plants can sustain significant harm from over 100 insect species, including 20 economic pests. Since rice plants are their host plants, insect pests continue to be a concern to rice production. The brown planthopper (*Nilaparvata lugens* Stål), a significant economic rice pest in India, is the subject of this review. Brown planthoppers are a major rice pest that affects rice all throughout the world, but particularly in India. Comprehending the biology and ecology of this pest will improve the creation, development, and use of efficient control strategies. Integrated pest management (IPM) calls for environmentally friendly control methods that maximize the activity of natural enemies and other biological control agents while minimizing the usage of synthetic pesticides.

### Importance Of Brown Planthopper

One of the most damaging rice pests in the Asia-Pacific are India, China, Sri Lanka, Bangladesh, Thailand, Vietnam, Malaysia, Korea, Japan, Indonesia, Philippines, Fiji, Papua New Guinea, and the Solomon Islands are among the countries where brown planthoppers (BPH) can be found. Rice productivity and food security are at risk due to BPH's growing pesticide tolerance and adaptability to resistant cultivars. BPH outbreaks happen when the population of Arthropod Natural Enemies (ANEs) declines due to agronomic practices, excessive fertilizer and pesticide use, or natural occurrences like drought and floods. As herbivores, they may be secondary pests, but favorable climatic conditions may cause them to become important rice pests.

### Biology Of Brown Planthopper

BPH eggs are usually laid in groups at lower part of the rice plant, especially in sheaths and also in leaf blades. But the sizes and sites of egg-groups depend upon the growth stage of the rice plant. When the adult population is high, eggs are found in the upper parts of rice plants. The egg stage is about 7 to 11 days in the tropics. The nymphal stage is 10 to 15 days via five instars.

The pre-oviposition period averages 3 to 4 days for brachypterous females and 3 to 10 days for macropterous female's constant temperatures of 20–33°C. Pre-oviposition

period of migratory macropters were prolonged by approximately 1 month. Duration of each stage depends on temperature and cultivars. In the greenhouse each female lays about 100 to 200 eggs. The adults and nymphs usually stay on the lower parts of rice plants. However, when the population is very high—more than 500 per hill— they are observed to swarm even on flag leaves, the uppermost internodes of panicles, and panicle axes. The seasonal occurrence of *N. lugens* in the India depends on availability and longevity of standing rice plants.



### Symptoms of Brown Planthopper



Symptoms- Hopper burn in rice caused by BPH

## Ecology Of Brown Planthopper

*Oryza sativa* L. or rice, is BPH's preferred host plant. The bug has been seen to use other plants as an alternate habitat. *Eleusine coracana*, *Leersia hexandra*, *L. japonica* Makino, *Saccharum officinarum* L., *Zea mays*, *Zizania latifolia*, and *Zizania longifolia* are some of the alternate hosts that have been found.

Abiotic factors can also influence BPH development and population dynamics, including outbreaks in rice field. This includes mean temperature, rainfall and relative

## Biological Control Of Brown Planthopper

Biological control may involve the use of natural enemies such as predators, parasitoids and entomopathogens to lower BPH population in rice field. BPH population was low, partly due to presence of predators such as mirid bugs (*Cyrtorhinus* spp., *Tytthus parviceps*). Predatory spiders, aquatic bugs (*Microvelia* spp.), coccinellid beetles (*Coccinellidae*), ground beetles (*Carabidae*) and rove beetles (*Staphylinidae*) also suppress BPH population. *Cyrtorhinus lividipennis* which is a predator of both eggs and larvae of BPH apparently prevents the increase of the BPH population in drilled rice fields. At least 19 species of hymenopterans *Eulophidae*, *Mymaridae* (*Anagrus* sp.), and *Trichogrammatidae* (*Oligosita* sp.) are egg parasites of BPH.

## Cultural Control

Perhaps as old as agriculture itself, cultural control is the most straightforward form of control. Cultural control, in contrast to insecticidal control, may not provide results right once, but it offers a first line of defence against pest attacks and is based on economic and ecological principles. Although they can live on other hosts, insects do not proliferate as effectively as they do on rice plants. Insect pest populations are consequently decreased during the fallowing period when rice is not planted. The pest's life cycle and population growth are disrupted when rice plants are

humidity. Temperatures between 25 and 30°C are considered optimal for egg and nymphal development of BPH. The rate of development increases as temperature increases. A humid environment (70 to 85% relative humidity) is preferred by *N. lugens*, and is conducive to its development and population increase. A relatively warm and high humidity environment favours the outbreak of this pest. It was suggested that typhoons could reduce BPH numbers and the limited air movement within the microhabitat could increase populations.

rotated with other annual crops or left fallow between two rice seasons. Insect pest populations can be decreased by rotating with non-host plants like marigold flowers, sweet potatoes, mung beans, and soybeans. The population and effects of BPH should be further reduced by incorporating crop rotation with resistant types (IR26, IR28, and IR30).

## Chemical Control and Pest Resistance

In most rice growing regions, chemical control is still a common method of controlling BPH, due to intensive and indiscriminate use of insecticides, this pest has gradually developed resistance to most of the chemical insecticidal classes. These major classes of synthetic insecticides include organophosphates, carbamates, pyrethroids, neonicotinoids, insect growth regulators, and phenyl pyrazoles. The neonicotinoid insecticide, imidacloprid, was introduced into Asia to control BPH in the early 1990s. Insect resistance to insecticide chemicals involves the mutations of detoxifying enzyme genes and amino acid mutations of targeted genes. Since then, Pymetrozine, thiamethoxam, flupyrrolidone, nitenpyram, dinotefuran, sulfoxaflor and chlorpyrifos have been introduced and widely used in controlling this pest.

## CONCLUSION

Brown planthopper (*Nilaparvata lugens* Stål) is one of the important economic pests of rice that is prevalent in Asia and Pacific regions. It

is a serious pest that is considered a threat to rice production in the India. Understanding the ecology and biology of this pest is a prerequisite for developing and implementing effective control measures. The control strategy that has been proven effective against brown planthopper is integrated pest management (IPM). IPM programs are usually

eco-friendly and oriented towards minimum use of synthetic pesticides. The objective of reducing pesticides is to boost the activities of natural enemies and other biological control agents. Integration of host resistance, biological and cultural control are therefore recommended to manage brown planthopper.