

Botanical Control

- When the economic threshold level of the pest is about 3-5 insects/hill, botanicals may be preferred.
- Use of neem oil and some neem based chemicals like nethrin, nimbecidine and neemgold @ 5-8 ml/L with 0.5 ml liquid detergent as foliar spray can reduce the egg laying capacity of females significantly, thereby decreasing the population.
- Azadirachtin 5%W/W neem extract concentrates @ 200g/ha can be used. Extract of the water pepper leaf (*Polygonum hydropiper*) @ 20 gm/L with 0.5 ml liquid detergent can kill BPH.
- Combination of neem oil or the above mentioned neem based chemicals with half dose of insecticides can control the pest.



Fig 3 : Neem oil and Water pepper

Chemical control

- When the economic threshold level is 5-10 insects/hill, chemical management options may be used.
- Insecticides with high efficacy at low dose such as imidacloprid, thiomethoxam can be applied @ 0-125 g/ha, whereas as clothianidin can be used at @ 20 - 22 g/ha. Ethofenprox, fipronil can be used @ 750-1000 g/ha.
- Commonly used insecticides like chlorpyrifos @ 1.5 ltr/ha, carbofuran granule @ 1 kg a.i./ha can be effectively used for controlling BPH.

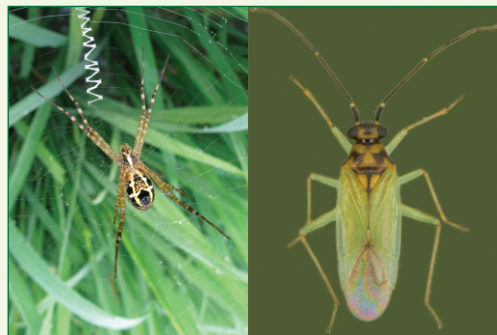


Fig 4 : Argiope spider and Mirid bug, *Cyrtorhinus lividipennis*

Success story

- Effective monitoring of BPH population during first week of September and application of imidacloprid/ thiamethoxam/ acephate/ chlorpyrifos at the initial stage of BPH population (6-10 insects/hill) successfully controlled the pest in 100 acres of rice seed production area with Pooja variety at Mahanga block, Cuttack (Odisha) during *Kharif*, 2014.

Integrated Management of Brown Plant Hopper (BPH)



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Integrated Management of Brown Plant Hopper (BPH)

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Brown Plant Hopper, *Nilaparvata lugens* Stal (Homoptera: Delphacidae) is a serious pest of paddy in almost all rice growing regions of India. Recently, plant hopper outbreaks have been intensified across Asia resulting in heavy rice yield losses. This is attributed to their ability to tolerate a wide range of temperature and humidity, rapid adaptation to adverse environment, changes in virulence, development of insecticide resistant populations, emergence of large winged adults and long distance migration.

Occurrence and distribution

Though, BPH has been a pest of rice since 1900, large-scale field damage was reported for the first time in India during 1972 from Kuttanad area of Kerala. Severe outbreak with considerable economic damage was experienced towards the year 1973 and continued up to 1983. The rice growing states like Kerala, Odisha, West Bengal, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Bihar, Haryana and Punjab suffered heavy BPH incidence and subsequent yield loss of rice. The pest was not in devastating form during 1983-1997 except of occasional occurrence in some areas. The credit was rendered to the cultivation of some resistant varieties as well as development and use of new pesticides. But the damage again became severe in different states during 1998 -2011, particularly in Andhra Pradesh, Punjab, Tamil Nadu, Odisha, Karnataka, Haryana and Uttara Khand. From 2005-06, there were sporadic but large-scale occurrences of BPH in Bihar, Jharkhand, Uttar Pradesh, Haryana and Punjab. From 2007-08 onwards, BPH attained number one pest status in the entire Indo-Gangetic belt stretching from West Bengal, Bihar, Jharkhand to Uttar Pradesh, Haryana and Punjab. AICRIP on rice had reported widespread plant hopper outbreaks at Ludhiana, New Delhi, Raipur, Nalgonda during *Kharif* 2013. In 2014, CRRRI reported outbreaks and severe BPH damage in coastal districts of Odisha.

The total yield loss due to BPH ranges from 10% in moderate infestation to 70% in severe infestation. The damage to the standing crop sometimes reaches 100%.

Predisposal factors

- In eastern India, generally the infestation happens during March-April in dry season and August-October in wet season.
- Continuous cultivation of high yielding but susceptible rice varieties with staggered planting times in a particular area contribute mainly towards the infestation of BPH.
- Closed spacing and standing water in the field provide suitable microclimate for pest population build up.
- Application of high dose of nitrogenous fertilizer without or with low potassium fertilizer contributes to the tenderness of plants as well as high protein nitrogen in plant favors fecundity of the hoppers.
- Temperatures of 30±3°C are considered optimal for egg and nymphal development. Temperatures above 35°C and below 15°C, are unfavorable for insect survival.
- A range of 70 to 85% relative humidity is optimal for BPH development.

Symptomatology

Knowing the insect

- BPH is a very small brown color insect characterized by its jumping, hopping and side walking. The insect can be noticed at the basal portion of the plant just above the water level under dense canopy (Fig 1) which enables the pest to escape early detection by the farmer as well as makes the management measures more complicate.
- A female lays around 80-200 eggs at the basal part (leaf sheath) of the plant and the ovipositional incision can be seen as a brownish patch on the stem.
- Eggs hatch after 7-10 days of oviposition. The insect has five nymphal instars during its developmental period. Generally nymphs are white to brown in colour.
- Nymph takes about 12 to 14 days to become brown or white adult. In normal condition the adults are non-winged (brachypterous) and the egg laying starts 2 to 3 days after emergence. When insect population in a cropped area becomes more, winged (macropterous) forms develop and they migrate to infest new crop areas. Peaks in the population usually happen beyond 50-60 days after transplanting, or between the heading stage and harvest. The population increase is marked by congregation of insects to the number of 200-500 in a single rice hill.



Fig 1: BPH residing at base of the stem

Looking into the plant for BPH infestation

- Insect shelters at the basal portion of the plant just above the water level
- BPH sucks out the fluid and nutrients from rice plants to make it turn yellow initially
- Yellowing, browning and drying of plant occur over the time leading to the symptom "Hopper burn" (Fig 2).
- Presence of honeydew and sooty molds in infected areas at the plant bases

- Plants with ragged stunt or grassy stunt virus disease show yellowing of leaves and stunted growth.

Integrated Management of BPH

Before managing the insect

- Integrated management of BPH should be practiced by combining below mentioned strategies as per the availability of resources and economics of farmers. Surveillance and monitoring of the insect are prime necessities to make effective management operations.
- Depending on availability, non chemical method should be given first preference because of their cost-effectiveness, safety to users as well as to the environment.
- Chemical control should be used as a last resort and while using proper care should be taken at the time of application by wearing face and hand masks and also during safe disposal of pesticide containers.
- The foliar spray should be directed towards the base of the crop and it has to be repeated again after 7-10 days depending upon population. The amount of spray fluid per hectare area should be 500 lit./ha for hand sprayer and 200 lit./ha for power sprayer.
- Avoid using insecticides like phosphomidon, phorate, methyl parathion and synthetic pyrethroids as they are reported as resurgence causing chemicals.



Fig 2 : Field infestation of BPH (Hopper burn)

Strategies for insect control

Cultural method

- Draining out water from the insect-infested fields. Judicious use of fertilizer, preferably split application of nitrogenous fertilizer along with appropriate dose of potassium fertilizers should be followed to reduce the BPH population.
- Alley formation after each 8 or 10 rows in endemic areas helps in minimizing the population, pest monitoring and insecticide application in emergency.
- Susceptible varieties should not be grown continuously in the same area. They should be replaced by resistant/ tolerant varieties or a crop other than rice.

Resistant/tolerant varieties

- Use of resistant or tolerant varieties released in different states. They are - Udaya, Daya, Lalat, Saktiman (Odisha), Jyothi, Bhadra, Karthika, Makon, Remya, Kanaka (Kerala), Bharatidasan (Pondicherry), Sonasali, Nagarjuna, Vajram, Kishnaveni (Andhra Pradesh) and Mansarovar (Central Release) etc. These varieties should be grown suitably in BPH endemic areas of different states.

Predator/parasites

- *In situ* conservation of natural enemies especially the hunting spider, *Lycosa pseudoannulata* and *Argiope* sp. is very much effective against plant hoppers. Another important egg-feeding predator is the mirid bug, *Cyrtorhinus lividipennis* Reuter (Fig 3).