

## Botanical Control

- When the pest population is about 3-5 insects/hill, botanicals may be preferred. Use of neem oil @ 5 ml/L with 2 ml liquid detergent as foliar spray can kill the insects as well as reduce the egg laying capacity of females significantly, thereby decreasing the population.
- Azadirachtin 5% W/W neem extract concentrates @ 200 g/ha can be used. Extract of the water Pepper leaf (*Polygonum hydropiper*) @ 20 gm/L with 2 ml liquid detergent as an ITK can manage BPH effectively. (Fig. 4)
- Combination of neem oil or the above mentioned neem based chemicals with half dose of insecticides can also reduce the pest (Synergistic action).



Fig.4: *Neem oil and Polygonum hydropiper*

## 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 17.8SL @ 50 ml/acre or Thiamethoxam 25 WG @ 40 g/acre or Ethofenprox 10EC @ 200 ml/acre or Clothianidin 50 WDG @ 8-10 g/acre can be applied. Commonly used insecticides like quinalphos 25EC @ 600 ml/acre, carbofuran 3G @ 12 kg a.i./acre can be used for controlling BPH.

## Success story

- Monitoring of BPH population from first week of September and application of proper dose of neem oil or imidacloprid or thiamethoxam at the initial stage of BPH occurrence (6-10 insects/hill) successfully controlled the pest in farmers' participatory seed production area (100 acres) of Pooja variety at Mahanga block, Cuttack (Odisha) during Kharif, 2014.

# Management of Brown plant hopper- An old foe in new form

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# Management of Brown plant hopper- An old foe in new form

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Brown Plant Hopper, *Nilaparvata lugens* Stal (Homoptera: Delphacidae), commonly known as BPH, 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. Particularly after 2010, five-six outbreaks of this insect pest have occurred in the major rice growing states of Indian subcontinent. 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. Replacement of indigenous BPH-resistant local varieties with susceptible HYVs was thought to be the factor for such outbreaks. Again, 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, Nalganda during *Kharif* 2013. During 2014 and 2017, NRRI reported outbreaks and severe BPH damage in coastal and western districts of Odisha respectively, particularly in Cuttack, Jagatsinghpur, Bargarh, Sambalpur, Ganjam and Berhampur. The yield loss due to BPH ranges from 10% in moderate infestation to 70% in severe infestation. The damage to 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. But according to the recent observations, BPH can attack the crop upto milk stage of the panicle in the reproductive stage and the infestation period extends even upto November.
- Continuous cultivation of high yielding but susceptible rice varieties with staggered planting leads to BPH infestation.
- Closed spacing and standing water in the field provide suitable microclimate for build up of pest population.
- Application of high dose nitrogenous fertilizer without or with low potassium fertilizer contributes to the tenderness of plants which favours BPH feeding and egg laying.
- Temperatures of  $30\pm 3^{\circ}\text{C}$  with 70 to 85% relative humidity are considered optimal for egg and nymphal development. Temperatures above  $38^{\circ}\text{C}$  and below  $15^{\circ}\text{C}$  are unfavorable for insect survival.

## Symptom

### Knowing the insect

- BPH is a very small brown colour insect, remaining 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.
- 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 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. Population peak is generally observed 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 at the plant base

## Looking into the plant for BPH infestation

- The insect shelters at the basal portion of the plant just above the water level and sucks out the fluid and nutrients from rice plants to make it turn yellow initially. Later, browning and drying of plant occur over the time leading to the symptom "Hopper burn" (Fig. 2). Presence of honeydew with sooty molds in infected areas occurs at the plant bases. With continuous occurrence, the pest may transmit ragged stunt or grassy stunt virus disease to the crop.



Fig.2: Hopper burn

## Integrated Management of BPH- Strategies

### Monitoring and surveillance

- Surveillance and monitoring of the insect are prime necessities to carry out effective management operations. Agro advisory services are being issued by NRRI at fortnight intervals on regular basis from last several years. Earlier data suggests that under Odisha condition, BPH infestation starts from 1<sup>st</sup> week of September, hence monitoring should start from 1<sup>st</sup> week of September. The basal part of some rice plants are to be disturbed mildly with a stick, so that BPH jumps to standing water from which the economic threshold level or ETL of the insect can be known (5-10 insects/hill).

### 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 (Fig. 3). Another important egg-feeding predator is the mirid bug, *Cyrtorhinus lividipennis* Reuter.



Fig.3: Spider