IPM Package of Practices for Management of Rice Brown Plant Hopper (BPH)

Rice is the principle food crop in India. Rice crop is prone to stress throughout the crop growth period due to onslaught from different pests such as insects, nematodes, diseases, weeds and rats. Brown plant Hopper (*Nilaparvata lugens*) causes serious insect-pest problem during Kharif season. Brown plant Hopper is a pest of national significance.

Brown Plant hopper is the major problem in rainfed and in irrigated wetland environments and also occurs in the areas with continuous cultivation, submerged conditions in the fields, high shade, use of chemical fertilizers /pesticides and humidity. Closed canopy of the rice plants, densely seeded crops excessive use of nitrogen and early season insecticides spraying also favours insect development. The severe outbreak of BPH was noticed in the districts of Bolangir, Kalahnadi, Subarnapur, Nuapada, Bargarh in Odisha State during the year 2017-18 & 2018-19.

**Major States affected:** Odisha, Andhra Pradesh, Telangana

**Nature of Damage:**

- Both the nymphs and adults remain at the ground level and suck the plant sap.
- It is a typical vascular feeder primarily sucking phloem sap leading to hopper burn.
- At early infestation, circular yellow patches appear which soon turn brownish due to the drying up of the plants.
- The patches of infestation then may spread out and cover the entire field.
- The grain setting is also affected to a great extent. During sustained feeding, it excretes a large amount of honeydew.

Brown plant hopper nymphs and adults  Completely withered and desapped plant
Identification of pest:

**Egg:** Eggs are laid in a group of 2 to 12 in leaf sheath (near the plant base or in the ventral midribs of leaf blades). White, transparent, slender cylindrical and curved eggs are thrust in straight-line in two rows. (They are covered with a dome-shaped egg plug secreted by the female. Only the tips protrude from the plant surface).

**Nymph:** Freshly hatched nymph is cottony white, 0.6 mm long and it turns purple-brown, 3.0 mm long in the fifth instar.

**Adult:** Adult hopper is 4.5-5.0 mm long and has a yellowish brown to dark brown body. The wings are sub hyaline with a dull yellowish tint. It has two characteristic wing morphs: macropterous (long winged) and brachypterous (short winged).
Monitoring and surveillance:

Continual monitoring and accurate forecasting of pest population during the crop growing period could be useful in protecting rice crops against BPH. Accurate and timely forecasting of the pest incidence would support in planning effective mitigation. BPH infestation mostly starts from 1st week of September, hence monitoring should start from 1st week of September. To monitor BPH, the basal parts of some rice plants are to be disturbed mildly with a stick so that the insects jump to standing water from which their occurrence or ETL can be ascertained.

Roving survey: - Undertake roving survey at every 10 km distance at 7-10 days intervals (depending upon pest population). Everyday at least 20 spots should be observed.

Field scouting: - Field scouting for pests and bio-control fauna by extension agencies and farmers once in 3-5 days should be undertaken to workout ETL.

- The Economic Threshold Level (ETL) for the pest is: BPH: 5-10 insects/ hill in non-endemic area and 2/hill in endemic area.
- If the insect pest population is above ETL, apply any one of the mentioned chemical insecticide if the rice crop is at late vegetative or panicle initiation stage. Pest defender ratio (P:D) 2:1 may be useful to avoid application of chemical pesticides against plant hoppers. Wherever rice crop has become mature or when grain hardening is completed, no insecticide should be applied.

Management Practices

Pre-planting practices:

- Maintain field sanitation. Main fields and bunds must be kept free from weeds which harbour the BPH population.
- Susceptible varieties should not be grown continuously in the same area. They should be replaced by resistant/tolerant varieties or a non-host crop other than rice family. avoid sowing of ‘Swarna’ variety in BPH prone areas
- 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 Mansarover (Central Release) etc. These varieties should be grown suitably in BPH endemic areas of different states (recommended by NRRI, Cuttack.)
The Odisha State agriculture university (OUAT) has released a paddy variety - “Hasanta” which is observed to be promisingly tolerant in different districts of Odisha.
- Growing not more than 2 crops per year and using early maturing varieties reduces plant hopper abundance and damage.

Nursery to transplanting stage:

- Synchronous planting (planting neighbouring fields within 3 weeks) in an area and maintaining a rice free period is effective in BPH management.
- Alley formation after each 8 or 10 rows in east-west direction in endemic areas helps in minimizing the population and provide congenial environment for BPH.

Vegetative to harvesting stage:

- It is advised to alter the micro-climate of the rice plant through alternate wetting and drying technique (There should not be standing water for long time). The field should be at least drained for 3-4 days when heavy infestations occur.
- High dosages of nitrogenous fertilizers increases plant hopper population. Hence, split application of nitrogenous fertilizer along with split application of appropriate dose of potassium fertilizers should be followed to reduce chances of plant hopper out breaks.
Biological Management:

- In situ conservation and augmentation of natural enemies viz., Egg parasites like *Gotnatocerus* spp., *Anagrus Oligosita* spp., Larval parasites such as *Haplogonatopus* spp., *Pseudogonatopus* spp., Larval and pupal parasites like *Xanthopimpla flavolineata Brachymeria lasus*, *B. excarinata* and Predators such as Coccinellid beetles, Ground beetle, Rove beetle, Lynx spider, Long-jawed and Orb spider and an important egg-feeding predator is the mirid bug, *Cyrlorhinus lividipennis* is essential.

Botanicals and Biopesticides:

- 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 spray covering both the foliage and the base of the plants can act as an insect growth regulator and reduce the egg laying capacity of females significantly, thereby decreasing the population.

- If infestation is below ETL application of Bio-insecticides like 5% Neem seed kernel extract (NSKE) or commercial neem formulation containing *Azadirachtin* 1500 ppm @ 2.5ml/ litre of water or *Metarhizium anisopliae* 1.15% WP with spore count of 1 x 10^8 cfu/gm (1 Kg/acre) @ 2-5 g/litre may be applied aiming base of the plants.

- Extract of the Water Pepper leaf (*Polygonum hydropiper*) @ 20 gm/L with 2 ml liquid detergent as an ITK can manage BPHeffectively.

Chemical Control:

- If the pest has reached ETL, then any one of the following CIBRC recommended insecticide should be used: (1).Ethiprole 40% + Imidacloprid 40% WG @ 93.75 g/Ha or (2).Clothianidin 50 WDG @ 20-24 a.i/Ha or (3).Dinofuran 20% SG@ 150-200 g/Ha or (4).Ethofenprox 10% EC @ 500g/Ha or (5).Flonicamid 50% WG @ 150g/Haor (6).Pymetrozine 50% WG
@ 300 g/Ha or (7). Thiamethoxam 25 WG @ 100 g/Ha or (8). Triflumezopyrim 10% SC @ 250g/Ha. In endemic areas any one of insecticides listed at Sl. no 3, 5, 6 and 8 may be alternated and applied on need basis.

- The foliar spray should be directed towards the base of the crop and it has to be repeated again after 7-10 days on need basis. The amount of spray fluid per hectare area should be 500 lit./ha for hand sprayer and 200 lit./ha for power sprayer.

Precautions during Management:

- 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.
- Do not make cocktail or tank mix of more than one insecticide.
- Do not use same pesticide repeatedly; usage of alternate pesticides at intervals gives maximum result.
- Do not burn the infested rice crop, as it helps in quick dispersion / migration of the insect to other unaffected rice fields/crops.