
Integrated
Pest Management in rice

# Host-Plant Resistance

## Sources of resistance and released varieties

| Insect pest | Donors | Released varieties |
|---|---|---|
| 1. Gall midge | CR143, Eswarakora, Leuang 152, Ob 677, Ptb 10, Ptb 18, Ptb 21, Siam 29. | Sneha, Pothana, Kakatiya Erramallelu, Kavya, Rajendradhan 202, Karna, Ruchi, Samridhi, Usha, Asha, MDU 3, Bhuban, Samalei, Orugallu, Abhaya, Shakti, Suraksha, Daya, Pratap, Udaya, IR 36, Shaktiman, Tara, Kshira, Sarasa, Neela, lalat, Phalguna, Mahaveer, Vibhava, Divya, Dhanya Lakshmi, Surekha, Vikram, Kunti. |
| 2. Brown Planthopper | ARC 5984, ARC 6650, Karivennel, Leb Mue Nhang, Manoharsali, Oorapandy, Ptb 10, Ptb 18, Ptb 21, Ptb 33, Triveni.` | Chaitanya, Krishnaveni, Vajram, Pratibha, Makom, Pavizham, Manasarovar, Co-42, Chandana, Nagarjuna, Sonasali, Rasmi, Jyothi, Bhadra, Neela Annanga, Daya, Aruna, Kanaka, Remya, Bharatidasan, Karthika. |
| 3. White backed planthopper | Ptb 33 | HKR 120, HKR 120 |
| 4.Green Leaf hopper | Ptb 2, W 1263 | Vikramarya, Lal[illegible] Khaira, Nidhi. |
| 5. Stem borer | TKM 6 | Ratna, Sasyasree, Vikas |

# Multiple resistant varieties against pests and diseases

| Variety | Released in | Resistant to |
|---|---|---|
| Suraksha | Andhra Pradesh, Orissa, West Bengal | GM, BPH, WBPH, Bl |
| Vikramarya | Andhra Pradesh | GM, GLH, RTD |
| Shaktiman | Orissa, West Bengal | GM, BPH, WBPH, Bl |
| Rasmi | Kerala | GM, BPH, Bl |
| Daya | Orissa | GM, BPH, GLH, BLB |
| Samalei | Orissa, Madhya Pradesh | GM, BPH, GLH, Bl |
| Bhuban | Orissa | GM, BLB |
| Kunti | West Bengal | GM, Bl |
| Lalat | Orissa | GM, BPH, GLH, Bl |

GM= Gall midge, BPH = Brown planthopper, WBPH = Whitebacked planthopper,
GLH = Green leafhopper, Bl = Blast, RTD = Rice tungro disease, BLB = Bacterial leaf blight.

# Cultural control

Cultural practices are normal agronomic practices that are followed for increasing crop productivity. They include:

- Early and synchronous planting: This practice is useful in managing all the insect pests of rice.
- Judicious use of fertilizers: Balanced use of fertilizers is crucial for insect pest management and higher yields. Avoid excess use of 'N' fertilizers
- Cropping pattern or crop rotation – These are useful to break continuity in insect pest build up or in disease cycle in rice tungro disease endemic areas.
- Alleyways – Provision of alley ways of 30 cm width after every 2-3 meters is advised in BPH/WBPH endemic areas.
- Field sanitation – Stubble destruction soon after harvesting helps in preventing the carry over of stem borer and gall midge.
- Water management – water management is a key measure for tackling case worm, termites and planthoppers
- In case of planthoppers & caseworm – drain off water to reduce intensity of multiplication
- For termites – flooding of fields is recommended to reduce infestation

# Biological control

## Important natural enimies

| Insect | No of NE recorded | Natural enemies | Stage attacked |
|---|---|---|---|
| Stem borer | 185 | *Parasitoids*<br>*Telenomus spp.**<br>*Tetrastichus spp.**<br>*Trichogramma spp.** | Egg |
| Gall midge | 18 | *Parasitoid*<br>*Platygaster oryzae** | Egg/ larva |
| Planthoppers and leafhoppers | 130 | *Parasitoids*<br>*Anagrus spp.*<br>*Oligosita spp.*<br>*Gonatocerus spp*<br>*Gonatopus spp.*<br>*Predators*<br>*Cyrtorhinus lividipennis** | Egg<br>Egg<br>Egg<br>Egg/Nymph<br>Eggs/Nymph/adults |
| Leaf folder | 85 | *Parasitoids*<br>*Trichogramma spp*<br>*Macrocentrus spp*<br>*Brachymeria spp.*<br>*Tetrastichus spp.*<br>*Predators*<br>*Ophionea nigrofasciata*<br>*Paederus fuscipes* | Egg<br>Larva<br>Larva/Pupa<br>Pupa<br>Larva<br>Adult |
| Hispa | 5 | | |
| Armyworm | 50 | | |


* Important and effective

### Manipulation of natural enemies

- Release egg paraasitoids (for yellow stem borer- *Trichogramma japonicum;* for leaf flder-*Trichogramma chilonis)* @ one lakh insects/ha, 3-4 times at 15 day interval from 15 DAT
- Prefer insecticides safer to natural enemies
- Prefer granular formulation over sprays

### Common Predators

Spiders*

1. *Pardosa pseudoannulata*
2. *Tetragnatha maxillosa*
3. *Oxyopes javanus*
4. *Argiope catenulate*

Coccinellids

1. *Harmonia octamaculata*
2. *Micraspis sp.*

Aquatic predators

1. *Microvelia douglasi atrolineata*
2. *Limnogonus fossarum*

# Chemical Control-1

## Effective granular formulations of insecticides

| | | Rate[$] | SB | GM | WM | LF | RH | BPH | WBPH | GLH |
|---|---|---|---|---|---|---|---|---|---|---|
| Carbofuran | CB | 750 | *** | ** | *** | | ** | *** | *** | ** |
| Carbosulfan | CB | 1000 | ** | ** | ** | ** | * | *** | *** | *** |
| MIPC | CB | 1000 | ** | | * | | | *** | ** | ** |
| BPMC | CB | 1000 | * | | * | | | ** | ** | ** |
| Phorate | OP | 1250 | ** | *** | | | | ** | ** | ** |
| Quinalphos | OP | 1000 | *** | *** | | | | | | |
| Fenthion | OP | 1000 | ** | ** | ** | *** | | | | |
| Ethoprop | OP | 1000 | ** | * | * | | | * | * | * |
| Chlorpyriphos | OP | 1000 | ** | *** | ** | * | | * | * | * |
| Isazophos | OP | 600 | *** | *** | ** | *** | | *** | ** | *** |
| Cartap | NT | 750 | *** | | | *** | | ** | ** | ** |
| Fipronil | PP | 75 | ** | *** | ** | ** | ** | ** | ** | ** |

* : Moderately effective ** : Effective
*** : Highly effective PP= Phenyl pyrazole
OP = Organophosphate, CB = Carbamate, NT = Neiristoxin
$ = active ingredient / ha

# Chemical Control-2

## Effective spray formulations of insecticides

| Insecticide | | Rate$ | SB | LF | RH | BPH | WBPH | CW | GLH |
|---|---|---|---|---|---|---|---|---|---|
| Quinalphos | OP | 500 | ** | *** | ** | | * | | ** |
| Phosalone | OP | 500 | *** | ** | *** | ** | * | | ** |
| Monocrotophos | OP | 400 | *** | *** | ** | *** | *** | ** | *** |
| Chlorpyriphos | OP | 500 | *** | *** | ** | | | ** | |
| Acephate | OP | 750 | * | ** | | ** | *** | | ** |
| Fenitrothion | OP | 500 | * | ** | | | | * | |
| Phosphamidon | OP | 500 | ** | *** | ** | ** | ** | | ** |
| triazophos | OP | 500 | ** | *** | ** | ** | ** | | ** |
| Fenthion | OP | 500 | * | | *** | | ** | | * |
| Dichlorvos | OP | 500 | | ** | | ** | | *** | |
| Carbaryl | CB | 750 | * | ** | ** | *** | *** | * | ** |
| MIPC | CB | 500 | * | | | ** | ** | | ** |
| BPMC | CB | 500 | * | | | ** | ** | | ** |
| Carbosulfan | CB | 500 | * | * | | ** | ** | | ** |
| Cartap | NT | 300 | *** | *** | | ** | ** | ** | ** |
| Ethofenprox | ED | 75 | * | * | | *** | *** | | *** |
| Fipronil | PP | 50 | ** | ** | ** | ** | ** | ** | * |
| Ethiprole | PP | 50 | * | * | | *** | *** | | *** |
| Imidacloprid | NN | 25 | * | | | *** | *** | | *** |
| Thiamethoxam | NN | 25 | * | | | *** | *** | | *** |
| Thiacloprid | NN | 120 | * | * | | ** | ** | | ** |
| Buprofezin | GR | 100 | | | | ** | ** | | ** |

*  : Moderately effective  **  : Effective
***  : Highly effective  NT= Neiristoxin
OP = Organophosphate,  CB = Carbamate  ED = Ether derivative,
NN = Neonicotinoid,  PP = Phenyl pyrazole,  GR = Growth regulator
$ = Active ingredient / ha

# Economic Thresholds for common pests in Rice

| Pest | Economic Thresholds |
|---|---|
| Stem borer | 5-10% DH or 1 egg mass 1 moth/$m^2$ (after panicle initiation) |
| Gall midge | 5% SS (at active tillering stage) 5 SS/ $m^2$ in late planted susceptible variety in endemic areas |
| Brown Planthopper Whitebacked Planthopper | 10 insects per hill at vegetative stage, 20 insects/hill at later stages |
| Green leaf hopper | 2 insects/hill in tungro endemic areas. 20 - 30 insects/ hill in other areas |
| Leaf folder | 3 damaged leaves /hill post active tillering stage |
| Gundhi bug | 10 |

Apply insecticide only when pest population crosses threshold value

# Integrated Management of Brown Planthopper

Eggs

Nymphs

Schematic diagram of life cycle

Adult

Damage

Hopper burn symptoms

- Cultivate resistant variety.
- Apply recommended dose of nitrogen only.
- Make alley ways of 30 cm wide for every 4m at the time of planting.
- Drain out water from field for two days and let in again.
- Monitor the pest / predator population build-up at the base of the hills at least once in a week.
- When the infestation exceeds 5-10 insects/ hill spray carbaryl 0.75kg a.i/ ha, monocrotophos or BPMC @ 0.5 kg a.i/ha or acephate WP @ 0.6 kg a.i/ha or fipronil SC @ 50 g a.i/ha or ethofenprox EC @ 75g a.i/ha or imidacloprid or thiamethoxam @ 25g a.i/ha or apply carbofuran granules @ 0.75 kg a.i/ha or phorate granules @ 1.25 kg a.i/ha or fipronil granules @ 75 g a.i/ha..
- After flowering dust carbaryl @ 25-30 kg of formulation/ha preferably during afternoon hours.

Field view of alley ways in a resistant variety

# Integrated Management of Gallmidge

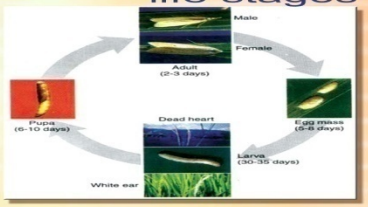

- Cultivate resistant variety. Suited to local biotype
- Maintain clean bunds.
- Destroy stubbles.

In case a susceptible variety is cultivated, also adopt:

- Timely planting
- Application of carbofuran or phorate granules @1.25kg a.i./ha in nursery, 5 days before pulling the seedlings in endemic areas
- Application of granules of carbofuran (0.75 kg a.i./ha) or phorate (1.25 kg a.i./ha) or quinalphos or chlorpyriphos @ 1 kg a.i./ha or fipronil @ 75 g a.i./ha after planting if the infestation exceeds 5% silver shoots.

# Integrated Management of Yellow Stem Borer

YSB life stages




Dead heart damage

White ear heads

- Cultivate tolerant variety.
- Destroy stubbles to eliminate hibernating larvae/pupae.
- Collect egg masses in nursery and destroy.
- Clip the leaf tips of seedlings before planting.
- Destroy the left over seedlings in the nursery.
- Apply recommended dose of nitrogen only.
- Install light or pheromone traps for attracting adults.
- Apply cartap or carbofuran or phorate granules @ 1.25 kg a.i./ha of nursery, 5 days before pulling the seedlings.
- Release the egg parasite, *Trichogramma japonicum* @ one lakh insects/ha , 3-4 times at 15 day interval.
- Carefully observe the crop at least once in a week for pest build-up.
- In vegetative stage, if the infestation exceeds 5% dead hearts, apply carbofuran or cartap granules @ 0.75 kg a.i./ha or phorate or quinalphos @ 1 kg a.i./ha or fipronil granules @ 75 g a.i./ha.
- After flowering, if the infestation exists @1 moth/$m^2$, spray quinalphos or monocrotophos or chlorpyriphos or endosulfan @ 0.5 kg a.i./ha or cartap WP @ 300 g a.i./ha or fipronil SC @ 50 g a.i./ha preferably during afternoon hours.

# Integrated Pest Management in Rice