

INSECT PESTS OF RICE CROP

- More than 100 insect species are associated with the rice crop at one stage or the other and 20 of these are pests of major economic significance.
- Among the YSB and sucking pests, BPH, GLH, WBPH, rice ear head bug pose severe threat to rice production.



Dr. Nihal R

MAJOR PESTS OF NATIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Brown Planthopper	<i>Nilaparvata lugens</i>	Delphacidae	Hemiptera
2	White backed Plant hopper	<i>Sogatella furcifera</i>	Delphacidae	Hemiptera
3	Rice Gundhi/ Earhead bug	<i>Leptocorisa acuta</i>	Coreidae/ Alydidae	Hemiptera
4	Yellow stem borer	<i>Scirpophaga incertulas</i>	Pyralidae	Lepidoptera
5	Leaf folder/ roller	<i>Cnaphalocrocis medinalis</i>	Pyralidae	Lepidoptera
6	Gall midge	<i>Orseolia oryzae</i>	Cecidomyiidae	Diptera

MAJOR PESTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Mealy bug	<i>Brevennia rehi</i>	Pseudococcidae	Hemiptera
2	Rice thrips	<i>Sternochaetothrips biformis</i>	Thripidae	Thysanoptera
3	Rice mite	<i>Oligonychus oryzae</i>	Tetranychidae	Acarina
4	Swarming caterpillar	<i>Spodoptera Mauritia</i>	Noctuidae	Lepidoptera
5	Army worm	<i>Mythimna separata</i>	Noctuidae	Lepidoptera
6	Case worm	<i>Paraponyx stagnalis</i> (<i>Nymphula depunctalis</i>)	Pyralidae	Lepidoptera

MAJOR PESTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
7	Hispa	<i>Dicladispa armigera</i>	Chrysomelidae	Coleoptera
8	Termite	<i>Odontotermes obesus</i>	Termitidae	Isoptera
9	Panicle mite	<i>Stenotarsonemus spinki</i>	Tarsonemidae	Acarina
10	White grub	<i>Holotrichia spp.</i>	Scarabaeidae	Coleoptera
11	Black bug	<i>Scotinophara coaracata</i>	Pentatomidae	Hemiptera
12	Blue beetle	<i>Leptisma pygmaea</i>	Chrysomelidae	Coleoptera

MAJOR RODENTS OF REGIONAL SIGNIFICANCE

Sl. No.	Common Name	Scientific Name	Family	Order
1	Smaller bandicoot	<i>Bandicota bengalensis</i>	Muridae	Rodentia
2	Soft furred field rat	<i>Millardia meltada</i>	Muridae	Rodentia
3	Indian gerbil	<i>Tatera indica</i>	Muridae	Rodentia
4	Field mice	<i>Mus spp.</i>	Muridae	Rodentia

OTHER PESTS

Sl. No.	Common Name	Scientific Name	Family	Order
1	Green leafhopper	<i>Nephotettix nigropictus</i> , <i>Nephotettix virescens</i>	Cicadellidae	Hemiptera
2	Zig-zag leaf hopper	<i>Recilia dorsalis</i>	Cicadellidae	Hemiptera
3	White rice leafhopper	<i>Cofana spectra</i>	Cicadellidae	Hemiptera
4	Pink stem borer	<i>Sesamia inferens</i>	Noctuidae	Lepidoptera
5	Pale headed striped borer	<i>Chilo suppressalis</i>	Pyralidae	Lepidoptera
6	Skipper butterfly	<i>Pelopidas mathias</i>	Hesperiidae	Lepidoptera

OTHER PESTS

Sl. No.	Common Name	Scientific Name	Family	Order
1	Butterfly/horn worm	<i>Melanitis leda ismene</i>	Nymphalidae	Lepidoptera
2	Grasshopper	<i>Oxya nitidula,</i> <i>Hieroglyphus banian</i>	Acrididae	Lepidoptera
3	Phadka Grasshopper	<i>Hieroglyphus nigrorepletus</i>	Acrididae	Lepidoptera

1. Yellow stem borer

Scirpophaga incertulas
(Pyralidae: Lepidoptera)

- **Distribution:** All Asian countries
- **Host range:** **Monophagous** or specific pest



Identification

Egg: Oval, flattened, pearly white at the time these are laid

- Turn black before hatching

Larvae: Yellowish white with well developed **prothoracic shield**.

- Fully grown larvae are dirty white or greenish yellow with brown head and pronotum

Pupa: Dark brown in colour

Adult: Yellowish white with orange yellow forewings.

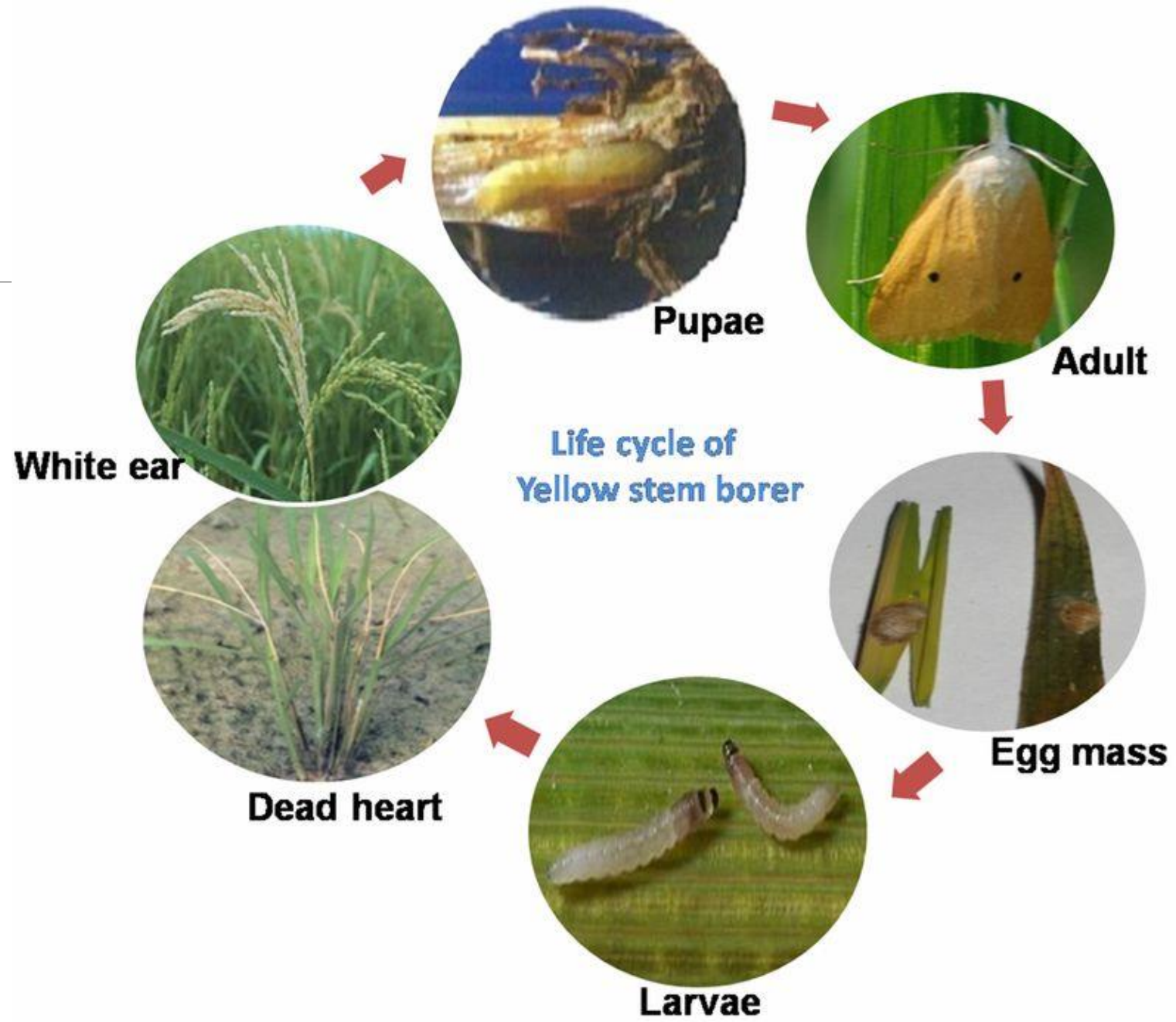
- Female moth is bigger than male and has a black spot on middle of each forewings
- Females at their abdominal tip have a prominent tuft of buff coloured silken hair





Biology

- Eggs are laid in a mass near the tip on the upper surface of tender leaf blade and covers them with buff coloured hairs and scales.
- The tiny black headed caterpillars feed for 2-3 days soon bore into the stem from the growing points downwards.
- Usually only one larva is found inside a stem but occasionally 2-4 larvae may be noticed
- The larvae grows in 6 stages
- Pupation occurs inside the attacked plant.
- The egg, larval and pupal periods are 5-8, 16-27 and 6-10 days respectively
- The entire life cycle is completed in 50 -70 days



Nature of Damage

- Only the caterpillars are destructive
- Larvae bores near the nodal region and feeds inside the stem causing drying of central shoot called **‘dead heart’ (vegetative phase)** or drying of panicles called **‘white ear’ or chaffyness** (reproductive phase).
- **October to December have been found conducive for multiplication**
- When a tiller is killed the caterpillar migrates to another tiller of the same or of different plant.
- **Damage is much higher in southern states where pests multiplies throughout the year and shifts from one crop to the next.**
- In northern India the pests has recently started appearing in serious proportions. Basmati varieties suffer heavy damage than coarse varieties.













Management

- Collection and destruction of moths using light traps.
- Mass trapping of yellow stem borer moths by installing pheromone traps @ 20 traps/ha with lures containing 10-15mg pheromone at 20 DAT
- The removal and destruction of stubbles at the time of first ploughing after harvesting the crop decreases the carry over to the next crop.
- Ploughing and flooding the fields also kills the larvae
- Clipping of rice leaf tips of nursery before transplanting eliminate egg mass of YSB and Rice hispa
- Inundative release of egg parasitoid *Trichogramma japonicum* @ 50000-100000/ha. at weekly interval, 3 times during vulnerable period of pest activity
- Other egg parasitoids effective are *Telenomus dignoides*, *T. rowani*, *T. beneficiens* (Scelionidae) and *Tetrastichuss schoenobii* (Eulophidae).



Management

- Seedlings root dip treatment for 12 or 14 hours before transplanting in 0.02% chlorpyrifos gives protection up to 30 days against stem borer, gall midge and leaf hoppers.
- ETL of 5-10% dead heart in vegetative stage and presence of 1 moth or I egg mass/sq.m. in the ear-head bearing stage has been suggested for chemical control.
- Spray insecticides per ha over a thin film of standing water in rice field at 20 day intervals commencing 15 days after transplanting up to shot blade stage affords control.
 - 25 kg Cartap hydrochloride or
 - 4G or fipronil 0.3G @15 kg or
 - 10 kg Chlorpyrifos 10 G or
 - 12.5 kg Phorate 10 G
 - Benfuracarb 3% GR or Chlorantraniliprole 0.4% GR

Resistant varieties

- From Mandya – **IET-2815**, IET- 3127
- From Cuttak – **TKM- 6**, Paichung- 16, Pt- 6-10, WC- 1263
- Moderately resistant varieties – **Ratna**, Sasyashree, **Jaya**, Vikas, **Shakti**, **IR- 20**, **IR-26**

2. Brown Planthopper

S.N: *Nilaparvatha lugens*
(Delphacidae: Hemiptera)

- **Distribution:** In Kerala (1973) it occurred in severe form for the first time.
- Sporadic pest in India during 1958 and 1962, but later on emerged as a key pest (Post green revolution era)
- **Host range:** Sugarcane, rice, grasses (*Leersia hexandra*) etc.
- These plant hoppers prefers rainfed and irrigated wet land rice fields compared to up land rice.
- The pest more severe in summer crop due to ideal condition during October to November, January to February.
- The crop loss is heavy in high rain fall condition



1 mm

Identification

- Two forms are available viz, **macropterous (long-winged) for migratory movement & colonization and brachypterous (short-winged).**
- Subsequent two or three generations are brachypterous.
- Towards crop maturity they become macropterous.
- The eggs are somewhat dark and cylindrical, having **two distinct spots.**
- Nymphs are brownish-black in colour and have greyish-blue eyes.
- Adults are brown, eyes and wings are hyaline with brown markings and dark veins.
- Legs are light brown and the tarsal claws are black.





Macropterous form	Brachypterous form
<ul style="list-style-type: none">• Have well developed wings	<ul style="list-style-type: none">• Have poorly developed wings
<ul style="list-style-type: none">• Smaller abdomen	<ul style="list-style-type: none">• Larger abdomen
<ul style="list-style-type: none">• Move from one field to another field	<ul style="list-style-type: none">• Can't fly, move by irrigation water
<ul style="list-style-type: none">• Dominant at post flowering stage	<ul style="list-style-type: none">• Dominant at pre flowering stage
<ul style="list-style-type: none">• Egg laying capacity is less	<ul style="list-style-type: none">• Egg laying capacity is more



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Biology

- Site of oviposition (S.O.O)- either side of the midrib of the leaf sheath in two rows (250 – 350 eggs).
- The egg & nymphal periods are 4-8 days & 2-3 weeks respectively.
- There are **5 nymphal stages**.
- In South India, the life-cycle is completed in 18-24 days during June-October, 38-44 days during November - January and 18-35 days during February – April.



Favourable conditions

- Incidence is high in September to October in North India.
- High humidity (80-90% RH) and Temperature 29 °C
- The adults remain most active from 10 to 32°C.
- Continuous cultivation of susceptible varieties
- Continuous cultivation of monocrop
- High Nitrogen application especially urea
- No wind
- Closer spacing (15x10 cm)
- Indiscriminate use of pesticides

Nature and Symptom of Damage

- One of the destructive pests in recent year. Very serious on the high-yielding varieties. Infests the crop at all stages of plant growth.
- It is a phloem feeder, Due to feeding **by both nymphs and adults** at the base of the tillers, plants turn yellow and dry up rapidly.
- A leaf necrosis resulting from the feeding and patched yellowing or circular patches of drying and browning of young plants (**hopper burn**).
- It has been noticed that even when the infestation is rather low, the tillering is adversely affected and there is diminished vigor and decrease in plant height.
- Yield loss ranging from **10-70%**
- Acts as a vector for **grassy stunt virus, ragged stunt and wilted stunt**



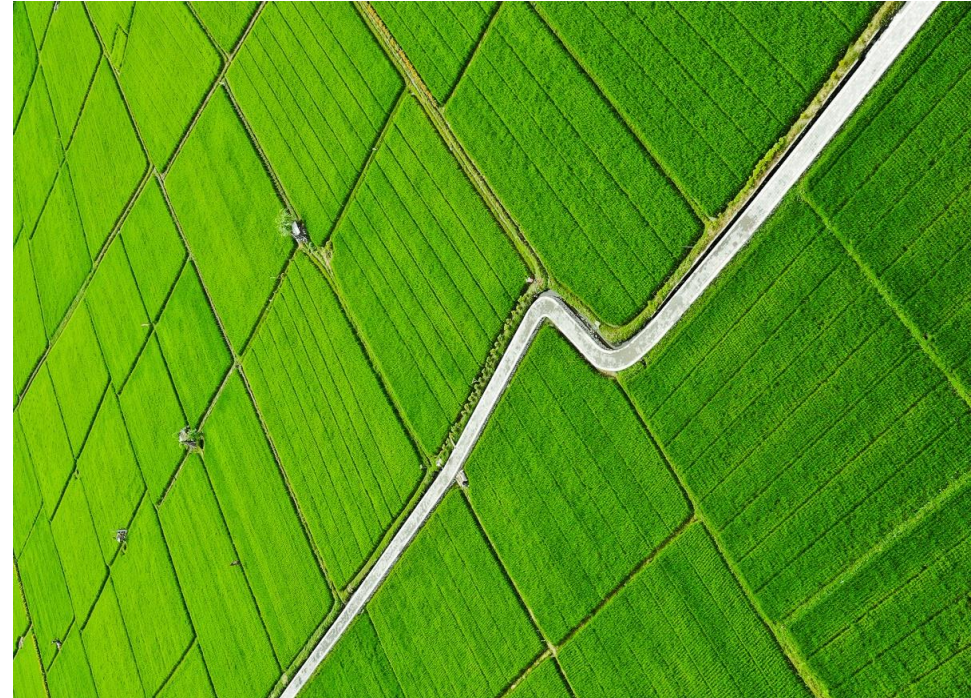


Resurgence of BPH

- Insecticide induced resurgence- exponential growth of BPH followed by application of resurgence insecticides but natural enemy population level is not sufficient to control them.
- The phytotoxic effect of certain insecticides like **acephate, methyl parathion, deltamethrin** etc. on rice attracts more macropterous hoppers immigration. The alighting followed by increased feeding: reproduction & longevity increased the resurgence.
- Increased feeding rate followed by application of resurgence- inducing insecticides **deltamethrin, methyl parathion & diazinon, quinolphos, cypermethrin and fenvalarate** etc.
- Stimulation of Resurgence inducing insecticides (RII) on hopper reproduction.
- Changes in the nutritional composition followed by RII like low calcium and high nitrogen.
- Exposure to sublethal doses, increase in reproductive rates- **Hormioligosis**.
- Timing & number of applications

Resurgence of BPH

- Method of application- foliar spray induced more resurgence than root zone placement and broadcasting.
- Cultural practices- not following **alley ways** that develops congenial microenvironment.
- Loss of natural enemies like spiders & mirid bugs



Management

- **Alternate wetting and drying the field** at peak infestation and draining out the standing water.
- Avoid closer spacing. Spacing recommended **is 20 x 15 cm.**
- In endemic areas, seedlings should be transplanted in Skip-row method.
- Alley ways 30 cm for every 3m provide proper aeration to the crop and also helps applicator to move freely in the field while spraying and for other intercultural operations.
- **Release of predators for effective control: Mirid bug, *Cyrtorhinus lividipennis* (Miridae) @100 bugs or 50-75 eggs/m² at 10 days interval. Wolf spider, *Lycosa pseudoannulata* (Lycosidae) a 3spiders/hill .**
- Egg parasitoids: *Anagrus optabilis* (Mymaridae), *Oligaosita sp.* (Trichogrammatidae), *Tetrastichus sp.* (Eulophidae).
- *Haplogonatopus sp.* (Dryinidae) parasitizes both nymphs and adults
- Entomopathogenic fungi: *Metarhizium anisopliae* or *Beauveria bassiana* suppresses the pest



Cyrtothrips lividipennis



Lycosa pseudoannulata

Management

- Neem oil or neem based products at 1 ml/lt water with 0.5 milligram detergent reduces pest population.
- ETL – 10-15 insects/hill at tillering stage and 15-20 at panicle initiation to booting stage- use any of these chemicals.
- Spray **Ethiprole** @ 50 g a.i./ ha or
Imidacloprid/ thiomethoxam @ 25 g a.i./ha
Etofenprox, monocrotophos, phasalone or chlorpyrifos @ 0.5 kg a.i./ha
Carbofuran 3G @ 0.75 kg a.i./ha or Phorate 10G @ 1.25 kg a.i./ha
- While spraying nozzle should be directed at the basal portion of the plants. If damage is noticed at hopper burn stage, treat the affected spots along with 3-4 m periphery immediately as these spots harbor high population of insects.

3. White backed plant hopper S.N: *Sogatella furcifera* (Delphacidae: Hemiptera)

- **Distribution:** Reported for the first time as a serious pest in the Punjab and other adjoining states of India in 1966.
- **Morphology:** Adult is straw colored, wedge shaped insect, with white back and darker veins.
- Nymph is greyish white and turns dark grey when it nears maturity.



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PICTURES



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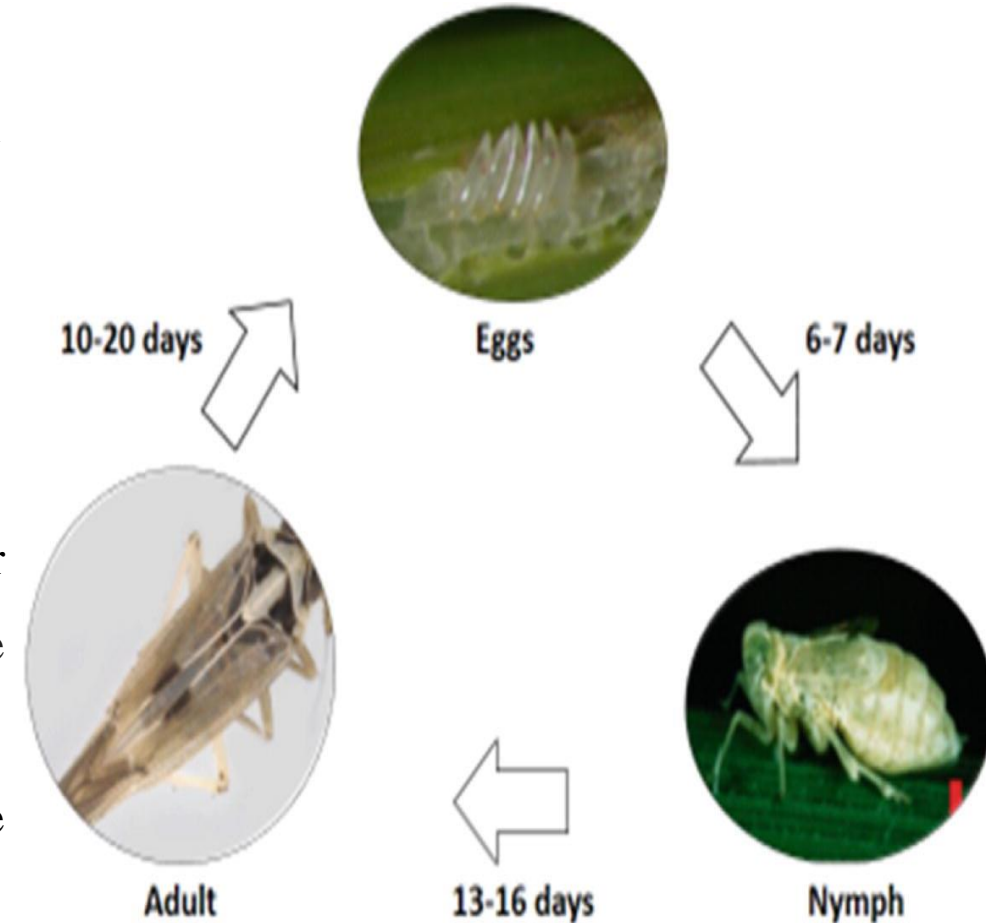
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Biology

- **S.O.O.- ventrally on midribs of leaf sheath.**
- The egg and nymphal periods are 4-8 and 14-21 days respectively.
- The life-cycle is completed in **18-29 days**.
- The adult female lives for about a week.
- It is a **multivoltine pest**.
- In northern parts of India, this pest is inactive in the winter and their population becomes noticeable only from May onwards on the paddy nursery.
- Breeding continues in southern states of India year around as the host crop is available with peak population at August to September.



Nature and Symptom of Damage

- In recent years, a number of leaf and plant hoppers have assumed pest proportions on the paddy crop in various parts of India.
- The nymphs and the adults suck cell-sap from the leaf surface and **tend to congregate on the leaf- sheath at the base of the plant.**
- **Numerous brownish spots** also appear on the feeding sites.
- **The leaves of attacked plants turn yellow and later on rust red. These symptoms start on the leaf tips and spread to the rest of the plant.**
- The attacked plants ultimately dry up without producing ears.
- **The insect also excretes honeydew on which a sooty mould appears, imparting a smoky hue to the paddy fields.**



Management

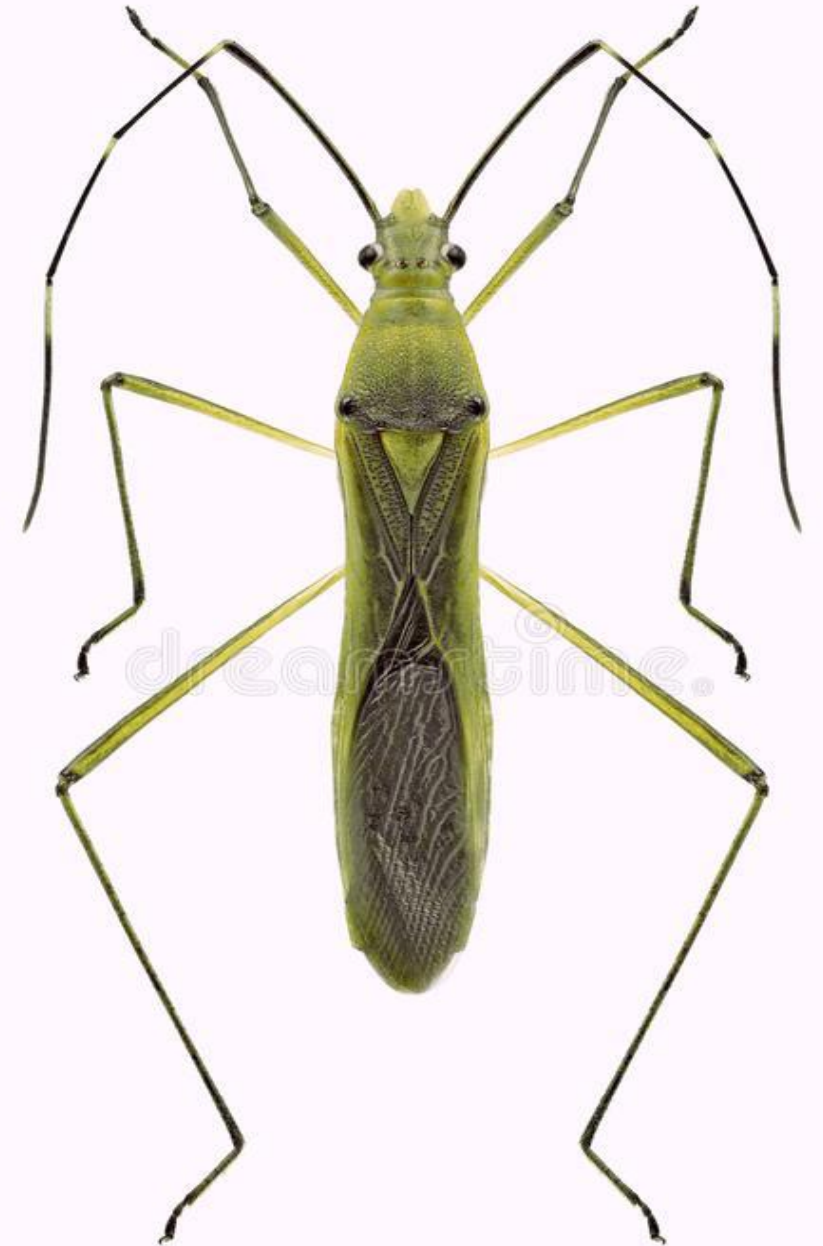
- ETL is 10-15 hoppers/hill at tillering stage; 15-20 hoppers at panicle initiation to booting stage.
- Same as in case of brown planthopper.

4. Gundhy bug

S.N: *Leptocorisa acuta*

Coreidae: Hemiptera

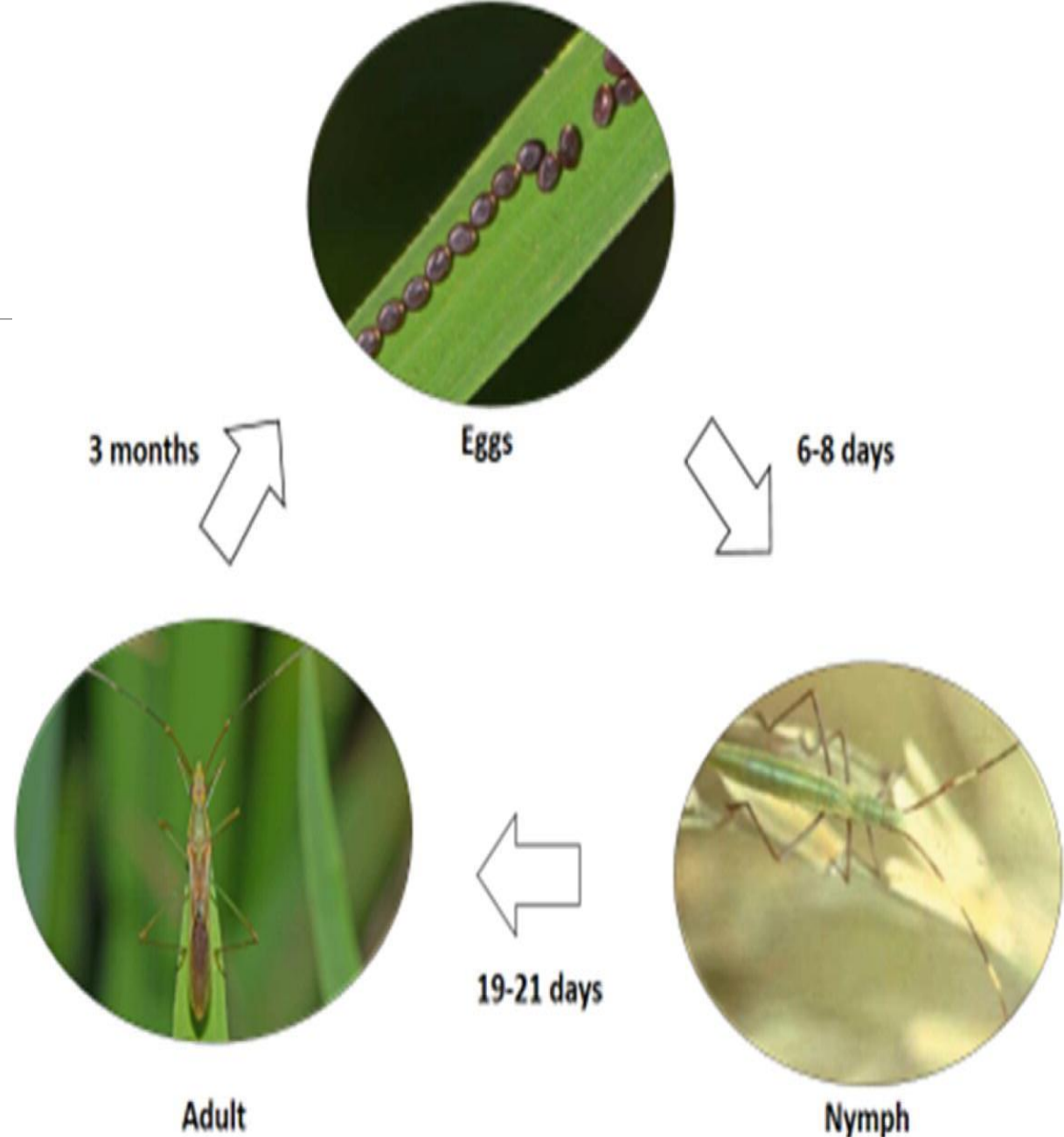
- **Distribution:** throughout India generally appearing before the flowering stage and continuing up to the milky stage.
- Sporadic pest.
- **Morphology:** The adults are slender, and greenish brown.
- They have long legs and antennae with four joints.
- Newly hatched nymph is pale green. However, as it grows, the green colour deepens.
- The grown up nymphs are very similar to the adults in colour and size, but they are apterous.





Biology

- **S.O.O. on leaf blade in long rows of 10 - 25 eggs.**
- Breeding takes place in winter also, but at a slower rate.
- **The pest is essentially diurnal. Multivoltine pest.**
- Egg, nymphal and adult period are 1, 2 and 3-4 weeks respectively.
- The rice bug breeds all the year round on grasses and various other green plants and appears in paddy fields generally in August and is most active from the middle of that month to November.



Nature of Damage

- Both the nymphs and adults feed on the sap of peduncle, tender stem and milky grains making them turn chaffy.
- Severely attacked field gives sickly appearance and emit a repugnant smell which gives to this pest the name 'Gundhy' bug.
- Black or brown spots appear around the holes made by the bugs on which a sooty mould may develop Individual grains are chaffy and with brown spot





Management

- Killing the bugs by using light traps, collecting the adults with nets and **destroying the weeds to remove alternative hosts.**
- **ETL 10 insects/ 100 heads or 1/m².**
- Dusting carbaryl 10%, or quinalphos 1.5%D or malathion 5%D, and repeat it depending upon the severity of infestation.

5. Green leafhopper

S.N: *Nephotettix nigropictus* and *N. virescens*
(Cicadellidae: Hemiptera)

- **Distribution:** All the rice growing regions of India, although they assume serious status in certain years in Madhya Pradesh, Andhra Pradesh, Orissa, West Bengal etc.
- **Host range:** Paddy, some grasses etc.
- The leaf hoppers has gained economic significance as a regular pest of rice and cause damage to the crop but also transmit viral diseases



Morphology

- Both the species are greenish and are smaller and slender than WBPH.
- The female of *N. nigropictus* is green and the male has two black spots extending up-to the black distal portion on the fore wings.
- It has a black tinge along the anterior margin of pronotum and a sub-marginal black band on the crown of the head.
- In *N. virescens* black sub-marginal band on the crown is absent and the black spots on forewings do not extend up-to the black distal portion.



1 mm



1 mm



1 mm



1 mm

Biology

- **S.O.O. in rows on the inner surface of the leaf-sheath in groups of 3-18.**
- The egg and nymphal periods are 3-5 and 12-21 days respectively.
- The adults live for 7-22 days in summer.
- There are about six overlapping generations from March to November.
- **The insect over winters in the adult stage.**
- The pest population is the maximum in July- September and decreases markedly after a heavy rain.

Nature of Damage

- The nymphs and the adults suck sap from the leaves of plants, turning them yellow and ultimately brown.
- As a result of attack by this pest, the plants lose vigour and turn yellow.
- Among the two species *N. virescens* causes more damage.
- *N. virescens* is also known vector of virus diseases, of which **Tungro** is the most serious.
- Green leaf hopper ETL in tungro virus endemic area is 2/hill
- **Both the species act as vectors of rice transitory yellowing and rice yellow dwarf**



Rice Tungro Disease



Management

- Spray application of **phosalone**
 - etofenprox**
 - cartap hydrochloride**
 - monocrotophos
 - acephate
 - chlorpyrifos
 - carbaryl (@ 0.5 kg a.i./ha or
- Phorate or sevidol or cartap hydrochloride or carbofuran @ 1 kg a.i/ha or **fipronil 0.3% G@ 25 kg/ha,**
- **Grow some resistant varieties – IR- 26, IR-30, Vani, Jaya, Ratna, Pankaj, Bhavani etc.**

6. Rice leaf folder/ leaf roller

S.N: *Cnaphalocrosis medinalis*
(Pyralidae: Lepidoptera)

- **Distribution:** Sporadic pest.
- Occurs in all rice growing areas of India.



Morphology

- Its greenish caterpillars are very agile and they feed inside the fold made by fastening together the edges of a leaf.
- The moths are golden or yellowish brown.
- The wings have 2-3 wavy lines characterized by dark bands.
- The eggs are oval, creamy white.
- In case of heavy infestation, the plants appear whitish and scorched.





Biology

- The moths which are nocturnal rest on the undersurface of the leaves during the day.
- **S.O.O. on the under surface of tender leaf blades.**
- It is very active and moves quickly in the leaf fold, when disturbed.
- **S.O.P. inside the leaf roll.**
- Egg, larval and pupal periods are 4-7, 15-27 and 6-8 days respectively.
- Total life-cycle varies from 25 - 42 days.
- In northern India, the pest is active from July to October and is at its peak during September-October.





Nature of Damage

- Damaging stage is caterpillar.
- The young larvae feed on tender leaves without folding them.
- The older larva rolls the leaf blade by fastening its edges with a sticky substance and sometimes even fastening the leaf tip to the basal part of the leaf blade and feeds from inside by scraping.
- The scraped leaves become membranous, turn white and finally wither.
- The infestation at boot leaf stage of the crop sometimes results in heavy loss of grain yield.
- A single larva may damage a number of leaves as it migrates from one leaf to another
- As a result of the attack, photosynthetic activity of the leaves is interfered with and the plants are predisposed to fungal and bacterial infections.
- In a severely infested field, the whole crop gives a sickly appearance with white patches.
- The heavily infested crop has streaks on the leaves and appears whitish from a distance.



Management

- Removal of grass from field bunds
- Light trapping of adults helps to reduce the pest population
- Application of super phosphate reduces the incidence.
- *Trichogramma japonicum* is an effective egg parasite of rice leaf-folder, causing a reduction of 12-60 per cent of its incidence.
- Release of the egg parasitoid *Trichogramma chilonis* @1,00,000/ha gives good control.
- Pupal parasitoid *Xanthopimpla emaculata*.
- *Bacillus thuringiensis* formulation at 1kg/ha is effective.
- The biopesticide *Pseudomonas flourescens* has been reported to cause 60-80 % larval mortality,

Management

- Spray any of the following insecticide at ETL of 10 per cent damaged leaves:
 - 875 ml of triazophos 40EC
 - 2.5 litres of chlorpyrifos 20EC
 - 1.4 litres of monocrotophos 36SL in 250 litres of water per ha
 - Imidacloprid at 125 ml
 - Indoxacab at 500 ml per hectare is effective.
- Need based spraying of phosalone or etofenprox or cartap hydrochloride or quinalphos or fenthion at 0.5 kg a.i/ha or spray of fipronil 5 SC at 1 litre/ha.

7. Rice gall midge

S.N: *Orselia oryzae*

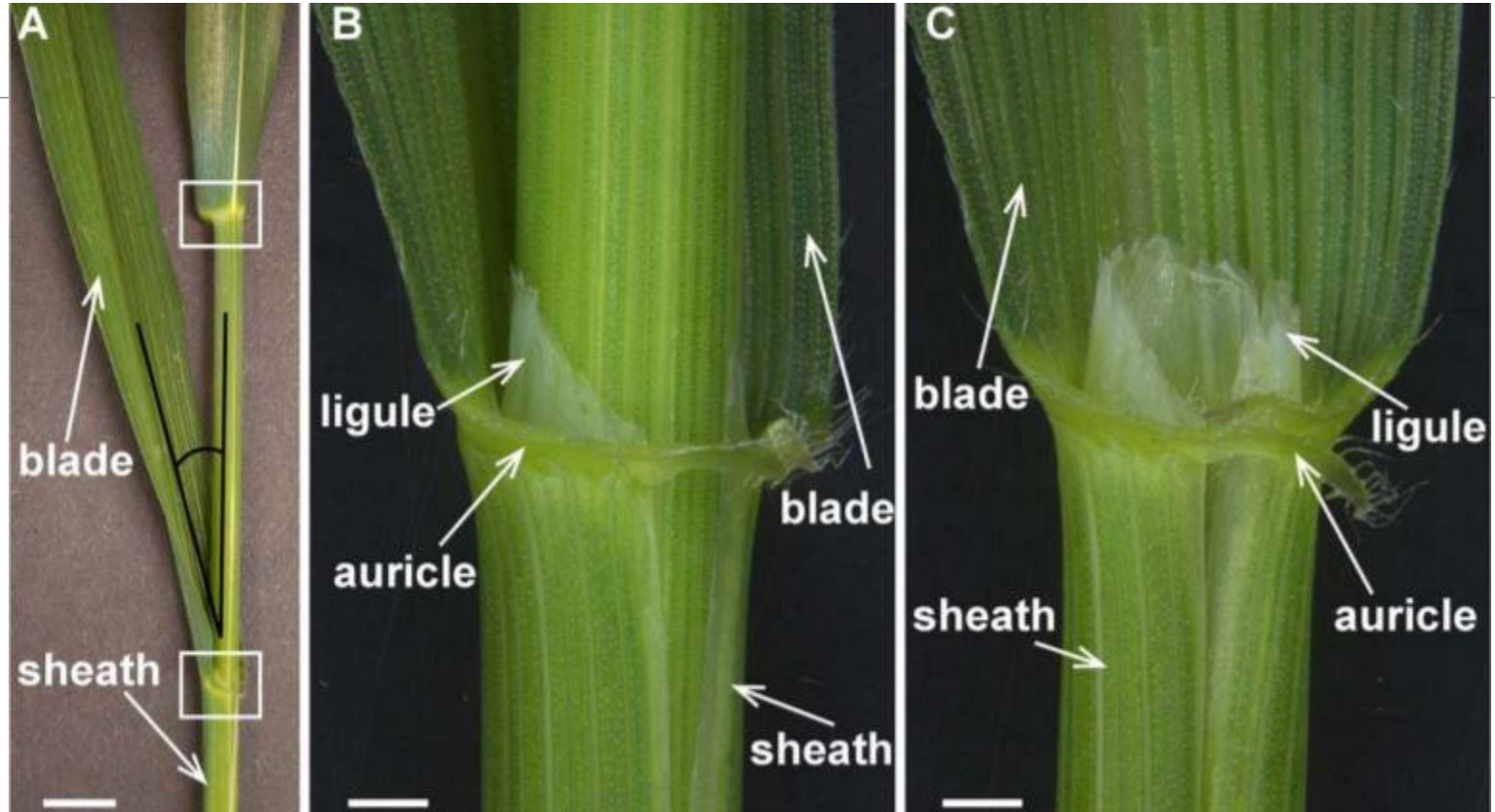
(Cecidomyiidae: Diptera)

- **Distribution:** Throughout India
- Appeared in Uttar Pradesh for the first time during 1971.
- It is destructive in some parts of Kerala, Assam, Andhra, MP and Bihar
- **6 biotypes of gall midge has been observed.**
- **Host range:** The insect breeds on a number of wild grasses and migrates to the paddy crop when it is in **tillering stage**



Biology

- It attacks the crop from may to September in Bihar and from mid-august to October in west Bengal.
- In the southern states, its maximum attack is between third week of august and mid-September.
- The yellowish brown fly is nocturnal, lays reddish elongate tubular eggs singly or in groups of 2-6 on just below or above the ligules of leaf blade.
- The maggot feeds on the shoot primordia resulting in the suppression of the apical meristem and formation of radial ridges.
- Only one larva develops in a shoot apex and throughout its development it remain inside the tubular gall formed due to its feeding.
- The development may be staggered due to larval dormancy.
- Pale red coloured maggots feeds on the growing points.
- S.O.P. inside the gall



Biology

- Overwintering stage is larvae in stubble.
- At the time of adult emergence, pupa wriggles up to the tip with the help of abdominal spines and cuts a hole at the tip of the gall from which the fly emerges.
- The egg, maggot and pupal period are 3-4, 15-20 and 2-8 days respectively.
- **The life cycle occupies 19-21 days but in winter it takes 32-39 days.**
- **There are 3-5 overlapping generations on the same crop and 5-8 in a year.**
- Females mates only once and unmated females lay sterile eggs
- **Gall is a modified leaf sheath**

Favourble conditions

- Over aged seedlings
- Late transplanting
- Climatic factors







Nature of Damage

- The maggots enters the stem and reaches the apical point of the central shoot or the tiller where it develops.
- Owing to its feeding, some physiological changes takes place which hamper the normal plant growth.
- The central leaf of the attacked tiller becomes hollow and deformed and there is a swelling or gall formation on the basal portion.
- The maggots feed on the shoot apex resulting in the suppression of the apical meristem and formation of radial ridges (attributed to the diversion of nutrients from the apical meristem to the maggot from the innermost leaf primordium and is followed by elongation of the leaf sheath possibly due to an active substance called **Cecidogen secreted by first instar maggot**).
- This secretion is responsible for cell proliferation of meristematic cells, **a gall formation**.
- Its growth is stopped and the central leaf ultimately turns into a hollow outgrowth, giving shiny silvery colour called **Silver shoot or onion shoot or Anaikomban**

Nature of Damage

- Formation of hollow pink or purple, dirty white or pale green cylindrical tubes bearing at their tips a green reduced leaf blade with complete ligules and auricles.
- The infested tillers do not bear any ears.
- Infestation in the early growth phase is known to induce subsidiary tillering after the death of primary tillers. Then these tillers are also infested.
- In long duration varieties, infestation during the late vegetative phase results in branching of the tillers which bear ears, thus compensate, to some extent, for the loss in yield.
- The gall dries up after adult emergence.
- It infests the rice even in nursery but tillers are referred.
- When a large number of tiller is attacked they will not bear any panicles and 35-45 days old crop suffers to a great extent. (losses up to 50% is reported during severe infestation)



Management

- Careful timing of planting can avoid damage; once past tillering phase plant is not suitable as a host.
- The rice varieties, PTB 18 and PTB 21 are known to be resistant to this insect.
- Removal and destruction of weeds that serve as alternate host.
- *Platygaster oryzae* (Platygasteridae) @ 1 per 10m² is the most important parasite of gall midge maggots, causing 50-90% parasitisation depending upon humidity and rainfall.
- Apply insecticide at ETL of 1 gall per m² in endemic areas or 5% affected tillers in non endemic areas.
- 625 ml of chlorpyrifos 20 EC, 500 ml of quinolphos 25 EC or fenitrothion or carbosulfan 25 EC or etophenprox 10 EC and fipronil 5% SC @ 50-75 g a.i./ha, lambda-cyhalothrin 2.5 EC and 5 EC at 12.5 g a.i./ha and thiomethoxam 25 WG @ 25 g a.i./ha are effective
- Placement of carbofuran @ 2 kg a.i./ha near root zone after planting reduce gall midge infestation.

Management

- Seed treatment with chlorpyrifos 0.2% emulsion for 3 hours or seed mixing with imidacloprid @ 0.5 kg a.i./100 kg seeds provide protection for 30 days in nursery.
- Seedling root dip in 0.02% chlorpyrifos emulsion before transplanting for 12-14 hours gives protection for 30 days.
- Growing some resistant varieties: GMR- 17, Vikram, Phalguna, Shakti, Mahaveer, Karna, IR-36, PTB 21, HR- 42, Netravati etc.,

8. White leaf hopper

S.N: *Cofana spectra*

Cicadellidae: Hemiptera

Distribution: Sub-tropical and tropical regions of South Asia.

Morphology: The adults are yellowish and have a rounded, rather than swollen head and four black spots on the vertex.

- The nymphs are paler in colour.

Damage: both nymphs and adults suck the cell sap and cause discoloration of leaves.

- In severe infestation, the leaves turn brown and plants fail to produce ears
- Even in moderate infestation, significant reduction in the tillering is observed
- Often found with GLH, but don't act as a vector.





1 mm



- Management is same as in case of BPH

9. Zig-zag leaf hopper

S.N: *Recilia dorsalis*
Cicadellidae: Hemiptera

Distribution: Japan, Korea, Vietnam, Bangladesh, India, Sri Lanka, Malaysia.

Morphology: The adults are whitish grey hopper which has V-shaped and zig-zag brown lines on its forewings.

Damage: both nymphs and adults suck the cell sap

- Attack leads to **orange discoloration at margins** and become dry at tips.
- As younger leaves grow they also show same signs.
- **Act as a vector for Orange leaf (Virus) and yellow dwarf (Mycoplasma) diseases.**
- They are known to overwinter in egg stage



1 mm

10. Blue leaf hopper

S.N: *Typhlocyba maculifrons*

Cicadellidae: Hemiptera

Distribution: throughout India and south-east Asia.

- Primarily a pest of rice nurseries.

Morphology: small bluish insect having a yellowish vertex with a black patch and a black spot in the middle of pronotum.

Damage: both nymphs and adults suck the cell sap

- In the early stage of attack, exhibit white waxy lines
- As damage progresses, the leaves show symptoms of withering.
- If pest is not controlled, the plants die and entire nursery may be lost.
- Not known to be a vector.



11. Pale headed stripped borer

S.N: *Chilo suppressalis*
(Pyralidae: Lepidoptera)

Distribution: known as rice stem borer in Japan and Asiatic rice borer in other countries.

- In India, it is not an economic pest.

Host range: Mainly rice, occasionally on few wild grasses.

Morphology: moth with pale yellow wings.

- Male moths are smaller than the females.
- Newly emerged caterpillars has 5 grey-brown linear stripes on its body.
- When full grown it has a yellowish brown head.
- The middle dorsal stripe is lighter than the two along each side.



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Biology

- S.O.O. on leaf sheath. Newly emerged larvae feed on leaf sheath in groups.
- The 2nd and 3rd instar larvae disperse to adjacent plants. They bore into the culm through the nodes by the 10th day.
- As the larvae grow, plants wither, they disperse gradually to the neighbouring plants.
- The larvae bore into the stem through the stalk of the panicle and travel downwards until they reach the lowermost part of the stem.
- S.O.P. within the rice stalk either near the middle or in the basal internode.
- The hibernating larvae remain in the stems or stubble when the crop is harvested.
- They resume their development in spring and pupate followed by emergence of moths.
- The egg, larval and pupal periods are 4-10, 33-50 and 5-10 days respectively.
- The insect passes 1-4 generations depending on the climate of the habitat.

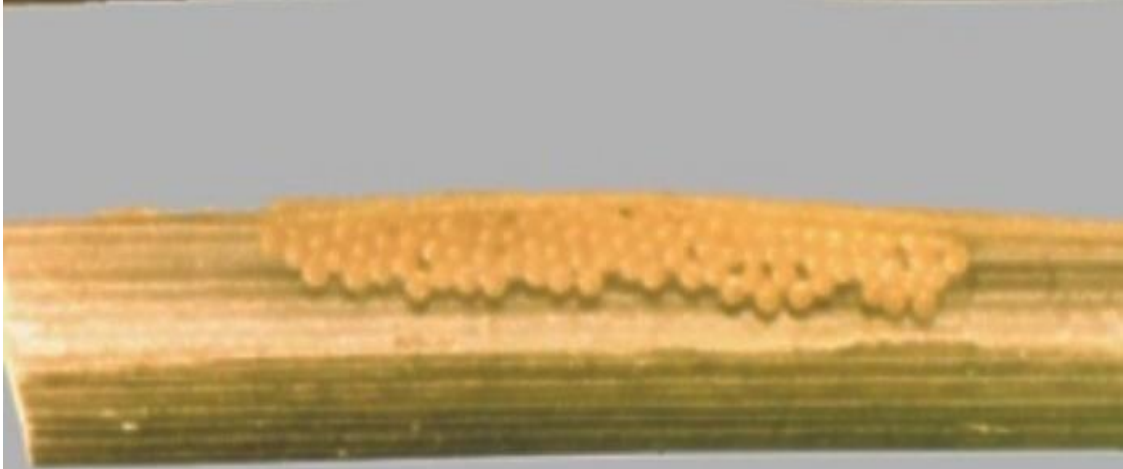


a

b

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Damage

- The injury to the plant is caused by caterpillars which tunnel through the stem and feed on the soft tissue.
- The leaf sheaths show transparent patches, and later turn yellow-brown and eventually dries up.
- The caterpillars as a result of their feeding inside the stem around the nodes, weaken the stem which easily breaks.
- Seedlings which have been attacked at the base show dead-hearts, i.e. the drying up of central shoots.
- Attacked plants bear white ears, indicating empty panicles or those with a few filled grains.
- Management is same as in case of yellow stem borer.



12. Dark headed striped borer/ Malayan borer

S.N: *Chilo polychrysus*
(Pyralidae: Lepidoptera)

Distribution: In India, it is also known as the Malayan borer.

- The insect was first noticed in Kerala in 1956 and since then has been reported in Tamil Nadu, Orissa, West Bengal and Assam.

Host range: Maize, sugarcane, *Panicum crusgalli* etc.

Morphology: Flat scale like eggs.

- The yellowish white caterpillar with black head capsule, a black thoracic plate and five longitudinal stripes on its body.
- The forewings of the male moth are brown ochreous with a cluster of dark spots covered with golden scales in the middle.
- The hind wings are white in comparison, the wings of the females are paler with smaller metallic spots.



Biology

- **S.O.O.- on the underside or upper surface of leaves.**
- The young caterpillar on emergence has the habit of a tissue borer and it tunnels within the leaf sheath, mid-rib or the stem.
- The larva moults 5 times.
- **S.O.P-inside stem tunnel in silken web.**
- The egg, larval, pupal and adult periods are 4-7, 23-36, 4-6 and 2-5 days respectively.
- The total life-cycle is completed in 26-61 days and there are six generations in a year.
- It infests rice from July to January.



Nature of Damage

- The caterpillars bore into the central shoot for feeding.
- As many as 7 larvae have been noticed in a single shoot.
- The adjacent tillers are also damaged by the larvae, which migrate to them, often resulting in the death of the whole plant.
- When there is severe damage, the loss may go up to 60 per cent of the crop.



Management

- Same as in case of yellow stem borer.
- Larval parasitoid is *Bracon albolineatus* Cam. (Braconidae).
- Pupal parasitoid is *Tenrastichus sp.* (Eulophidae).

13. Pink/purple stem borer

S.N: *Sesamia inferens*
(Noctuidae: Lepidoptera)

Distribution: Throughout India and Pakistan

Host range: Polyphagous. Cause significant damage to rice and maize.

- Other hosts are ragi, sugarcane, wheat, sorghum etc.

Morphology: Eggs are bead like. caterpillars are pinkish brown and have a smooth cylindrical body.

- The moths are straw coloured and have a stout body.



Biology

- The pest breeds actively from March-April to November on rice and then migrates to the wheat crop.
- The moths are nocturnal.
- S.O.O. on leaves or on the ground.
- Young caterpillars bore into the epidermal layers of the leaf sheath
- S.O.P. inside the stem or in between the stem and leaves.
- The egg, larval and pupa periods are 6-8, 21-28 and 7 days respectively.
- Life-cycle is completed in 6-7 weeks.
- There are 4-5 generations of the pest in a year.
- This pest is common during the dry pre-monsoon period.



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Nature of Damage

- Larva bore into the stem and cause stem tunneling and as a result of which the growing shoot dries up producing **dead-hearts**.
- When the attacked plants die, the larvae move on to adjoining plants.
- The older plants are not killed, but they produce a few grains only.
- **Management is same in case of yellow stem borer.**



14. Rice ear cutting caterpillar/ armyworm

S.N: *Mythimna separata*
(Noctuidae: Lepidoptera)

Distribution: Andhra Pradesh, Assam, Orissa, Punjab, West Bengal and peninsular India.

Morphology: The adult is a pale-brown moth.

- **The larvae are gregarious in habit and are commonly as armyworm**



Biology

- The eggs are laid in overlapping rows.
- Egg, larval and pupal periods have average durations of 24, 21.4 and 9.8 days, respectively under field conditions during July-December when the pest is present in the fields.
- S.O.P. in clumps of paddy, in cracks and crevices in ground or in loose soil.
- The total life- cycle is completed in 45.48 days.
- The insect is bivoltine (July to December).
- The damage to paddy crop is caused mostly during September to November,





Noctuidae
Mythimna separata

5 mm



Noctuidae
Mythimna separata

10 mm

Nature of Damage

- The damage to the paddy leaves and ears is caused by the caterpillars.
- The newly hatched larvae feed on the epidermis of the tender leaves.
- 2nd and 3rd instar larvae feed by cutting the leaf from the edge towards mid-rib.
- **The 4th, 5th and 6th instar larvae besides damaging leaves also cut off the panicles mostly at the base and hence the name rice ear-cutting caterpillar.**
- This stage (4th-6th instar) of the insect causes serious loss to the paddy crop.
- The larvae are shy of sunlight, hide in the ground during day-time and **generally feed at night**



Management

- **Deep ploughing is a cultural practice recommended**
- 3 Spraying the crop with 1 liter of quinolphos 25EC or 14 liters of monocrotophos 368L in 250 litres of water/ha.
- As the pest is nocturnal in behavior, the spray should be done in the evening hours for getting better results.

15. Swarming caterpillar

S.N: *Spodoptera mauritia*
(Noctuidae: Lepidoptera)

Distribution: In India it is found in all the rice growing areas in Kerala and Tamil Nadu Orissa Jharkhand Bihar and Chhattisgarh etc.

Host range: Upland rice is its preferred host. **Graminaceous species. Sporadic pest.**






- During the last few years it has emerged as a major pest in eastern India and caused severe losses to wet season rice production
- In Odisha the swarming caterpillars have swarmed over thousands of hectares of land in 2009 completely damaged paddy plants where complete loss has been reported.



Morphology

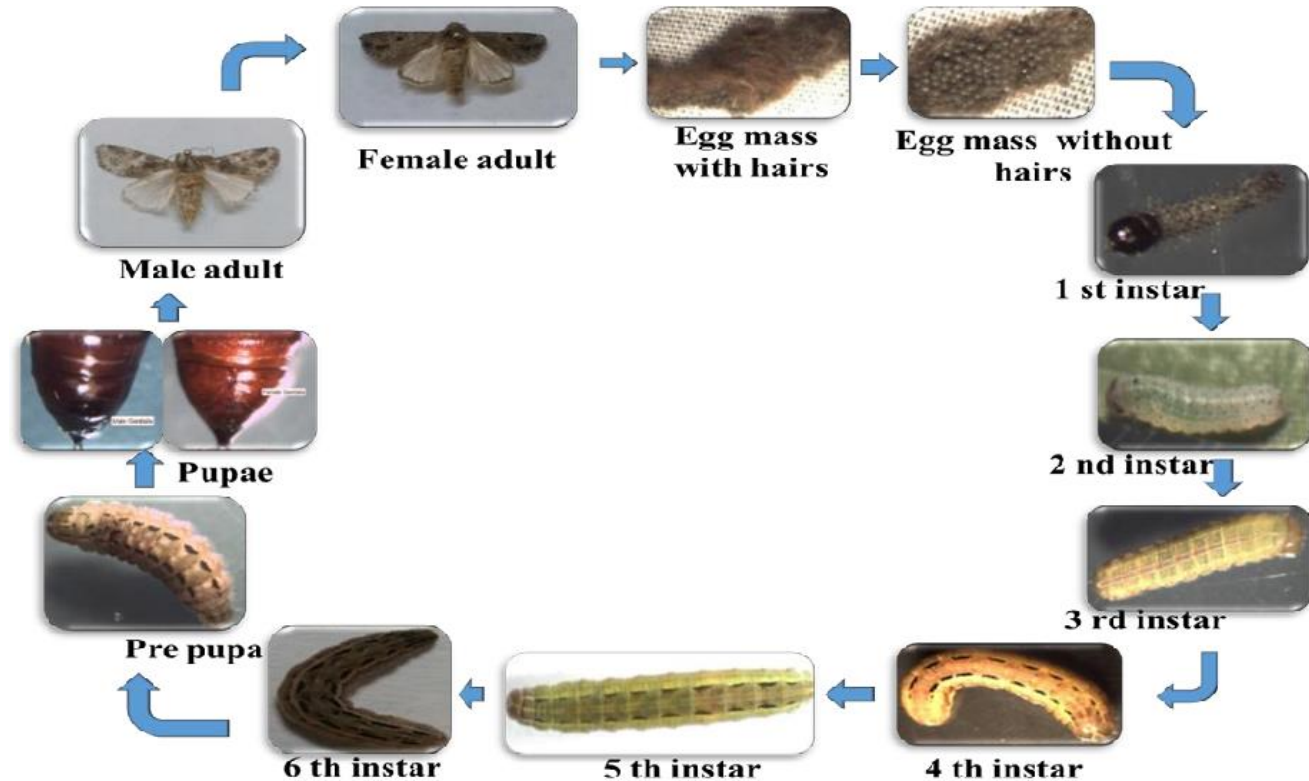
- Fully grown larva is cylindrical, dark to pale green with dull dorsal and sub-dorsal stripes.
- Adult moth is dark brown with a conspicuous black spot in each of the fore wings.
- The larvae are described to differentiate the several armyworm species from each other:



Rice swarming caterpillar or grass armyworm (<i>S. mauritia</i>)	Paddy armyworm, true armyworm (<i>Mythimna separata</i>)	Armyworm (<i>Pseudaletia unipuncta</i>)	<i>Spodoptera exigua</i>	<i>Spodoptera litura</i>
<p>Mature are green, grey. or brown in colour with dark dull dorsal and sub dorsal longitudinal stripes.</p>	<p>Mature larvae are green to pink in colour and provided with longitudinal light grey to black stripes running along the entire length of their bodies</p>	<p>Mature larvae are having yellowish or yellow-brown head capsule with dark net-like markings and a yellowish or greyish ground colour, more or less tinged with pink but a broad dark stripe dorsally and along each side.</p>	<p>The larvae are green in color with many light stripes along the backs broader stripe down the sides.</p>	<p>Larvae are brown or green with longitudinal stripes but are distinguished by the black spots ringing the body about 1/4th of the body length behind the head.</p>
<p>Two rows of C-shaped black spots are visible along their backs</p>	<p>Head is is brown to orange with an A-marking</p>	<p>A light pale orange subspiracular stripe mottled, and edged with white often is found laterally beneath the dark stripe.</p>	<p>The undersides are usually yellow in colour.</p>	
				

Biology

- **S.O.O.** on leaves in a mass and covers them with greyish hairs.
- The egg, larval and pupal periods are 7-8, 20-25 and 10-15 days respectively.
- **S.O.P.** an earthen cocoon in soil and the pupal period ranges from 10 to 15 days.
- The life cycle varies from 30-40 days.



Factors favouring population build-up

- Prolonged dry condition followed by heavy rainfall favours its outbreak.
- Wind and rain storm helps in migration of moths to long distances.
- Pest occurs throughout the year on alternate hosts and move to paddy in kharif season.
- Heavy rainfall leads to high mortality of larval population.
- Pest migrates from older rice to grassy areas for off season survival.



Damage

- **Cuts rice seedlings mostly at night in large scale similar to cattle grazing**
- In the transplanted crop the leaves are completely eaten away leaving behind the midribs of leaves.



Management

- Crop rotation in endemic pockets helps.
- Deep ploughing the field in summer exposes the larvae and pupae for predation by birds.
- Remove excess nurseries and weeds from the field and bunds
- Flooding the nurseries and small fields brings out the larvae to the surface, which get predated by the birds. Ducks if let into field, will feed on the caterpillars. A herd of ducks can easily destroy these caterpillars if let in to the fields.
- Use of bamboo perches facilitates predation by birds.
- In case of severe infestation, small plots can be isolated and the movement of the caterpillars can be prevented by digging a trench around the infested field wherever possible.
- Before the paddy season, grasses near the fields earmarked for paddy, may be destroyed mechanically which provide shelter and act as reservoir for migration of larvae

Management

- kerosene oil may be poured into the stagnant water in the bunded fields (2 lt kerosene/ hectare).
- With the use of a long rope stretched across the field (two persons walk through the field) the paddy plants are shaken rigorously. The larvae fall into the kerosenized water and ultimately die.
- Application of malathion dust (2% dust applied at 25 kg ha⁻¹) or chlorpyrifos dust (1.5%) or endosulfan dust (5%) along the bunds of the field kills the pest and also prevents the migration of larvae to other rice fields. The technique was widely adopted because it proved to be a cheap and effective method for managing the *S. mauritia* within a short time.
- Light traps can also be utilized for mass trapping of the moths.
- The vertebrate predators such as the common crow, the jungle crow, the cattle egret, the mynah, *Acridotheres tristis* have also been found to predate on the larvae of this pest.

Management

- Spray of chlorpyrifos 20 EC @ 2.5 litres ha or quinalphos 25 EC @ 2.0 litres ha or triazophos 40 EC @ 1.0 litres/ha or dichlorvos 76 SL 600 ml on the paddy crop during evening hours
- Dusting of chlorpyrifos 1.5 % D or endosulphan 5% D @ 30 kg/ha controls this pest.
- Spraying at early stage is very effective

16. Case worm

S.N: *Paraponyx stagnalis* (*Nymphula depunctalis*)
(Pyralidae: Lepidoptera)

Distribution: In all rice-growing tracts and may assume serious proportions in certain seasons in fields under swampy conditions.

Host range: Paddy and variety of grasses

Morphology: The adult is a small white moth with pale brown wavy markings.

- The larva is light green with a light brownish-orange head.



Biology

- S.O.O. undersurface of the leaves or grasses singly or in clusters.
- S.O.P. inside the case which is attached to the base of the tiller.
- The egg, larva and pupal periods are 4-6, 18-22 and 5-6 days respectively.
- The life-cycle is completed in about 5 weeks.



Nature of Damage

- It attacks the crop in the early transplanted stage
- The young larvae feed by scraping the leaf surface, The larva makes a cylindrical tubular case out of a portion of the leaf cut out from it and remains inside it, moving with the case on the leaves and feeds on them.
- They lead a semiaquatic life with tracheal gills floating in their tubular cases on the surface of water or attached to the stems at or above the water level.
- The leaf blades are eaten away completely leaving only the midribs.
- Leaf cases hanging from rice leaf and cut leaf bits floating in water-damage symptom
- The larva feeds by scraping the under surface of die leaf blade leaving the upper epidermis intact and as a result of scraping characteristic white patches are seen on the leaf blades.
- In case of severe attack, the tillers become stunted and lose their vigor and often the plants are killed.



Management

- Drain-off the water from the field to kill the floating larvae.
- Put some kerosene in the field water and dislodge the leaf-cases by shaking the plants by rope or by branches of thorny plant.
- Spray fipronil 5%SC at 50-75 g a.i. /ha or monocrotophos at 0.5 kg a.i/ha.

17. Rice hispa

S.N: *Dicladispa armigera*

(Chrysomelidae: Coleoptera)

Distribution: Throughout India from Andhra Pradesh to Kashmir. Often serious on young rice crop in parts of West Bengal, Andhra Pradesh and Tamil Nadu.

Host range: Paddy, number of grasses and sugarcane.

Morphology: The adult is a small steel bluish black beetle and is recognized by numerous short spines on the body which gives it a characteristic appearance.

- The apodous, creamy white grubs are not easily seen, because they are concealed inside the leaf tissue and are leaf miners



Biology

- This pest breeds actively from May to October and hibernates during winter probably in the adult stage.
- S.O.O. on nursery plants during May inserted in the leaf tissue towards the leaf tip.
- On hatching, the young grubs feed as leaf-miners, between the upper and lower epidermis.
- S.O.P. inside the leaf mine.
- Hibernates in adult stage.



Nature of Damage

- The damage starts in nurseries and spreads to the rice fields.
- Apart from the damage caused by grubs as leaf-miners, the adults also feed on green matter and produce parallel whitish streaks on the leaves.
- The attacked leaves turn membranous, showing characteristic blisters or blotches.
- Later on, the attacked leaves wither and die.
- Heavily infested crop presents sickly appearance
- The infestation varies from 6 to 65 per cent



Management

- The pest is suppressed if the infested leaf tips are clipped off and destroyed while transplanting (Seedling leaf clip method).
- The nursery beds are flooded, the beetles float and can be swept together with brooms and then destroyed.
- Spray at economic threshold level (1 adult or 1-2 damaged leaves per hill) with 2.5 litres chlorpyrifos 20EC in 250 litres of water per ha. If the attack continues, repeat spray after two
- Carbofuran 3%CG and phorate 10% CG at 1 kg a.i./ha, chlorpyrifos 20% EC at 250 g a.i./ha, lambda cyhalothrin 2.5% EC and lambda-cyhalothrin 5% EC at 12.5 g a.i/ha, malathion parathion 50% EC at 500-750 g a.i./ha., quinalphos 25% EC and quinalphos 25% Gel, at 250 g a.i. /ha and triazophos 20 % EC and 40% EC at 250-500g a.i./ha is recommended

18. Root weevil

S.N: *Echinocnemus oryzae*
(Curculionidae: Coleoptera)

Host range: paddy, certain grasses, *Fimbristylis tenera* etc.

- The grubs lead an aquatic life and feed on the root hair of the transplanted crop, thereby affecting plant growth and non-formation of tillers.
- Attack is severe in young plants.
- The crop transplanted in July is more heavily attacked than the one transplanted in August.
- Adult weevils resting on rice may be collected and destroyed.
- Application of super phosphate at 80 kg/ha has been said to deter the grubs from the active feeding zone of rice roots.



1 mm

19. Mealybug

S.N: *Brevennia rehi*

(Pseudococcidae: Hemiptera)

- **Host range:** Paddy, grasses etc.
- Its infestation causes sunken oval or round patches in a normal crop and the plants may either die or put forth distorted panicles with chaffy grains.
- This effect is produced due to the mealy bugs sucking the sap by remaining concealed within the leaf sheath of the plants.
- This type of damage is known as 'Soorai' disease in Tamil Nadu.





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Management

- Grass on the field must be properly trimmed
- Attacked plants must be removed and destroyed
- Spraying parathion 0.05% or monocrotophos @ 1.3lt per ha affords some protection

20. Rice thrips

S.N: *Stenchaetothrips biformis*
(Thripidae: Thysanoptera)

- **Host range:** Paddy, *Echinochloa crusgalli*.
- S.O.O. eggs inserted singly within leaf tissues in young leaves. The life cycle occupies 13-19 days.
- Pest of nurseries causing severe damage.
- The larvae and adults lacerate the tender leaves and suck up the plant sap causing marginal rolling and drying of the leaf tips.
- In case of severe infestation, the seedlings die.
- The infestation invariably disappears after sharp showers.
- Managed by topping
- Spray carbaryl 0.1% or fipronil 0.05%



21. Whorl maggot

S.N: *Hydrellia philippina*
(Ephydriidae: Diptera)

- The maggots feeds on leaf blades even before unfurling and the initial damage symptom is presence of narrow stripes of whitish area in the blade margins.
- The tillers become stunted.
- Damaged leaves become distorted and may break off in the wind.
- Spraying of quinalphos or fenthion at 0.5 kg a.i./ha or 50-75 g. a.i./ha
- Alternatively, application of granules of carbofuran or chlorpyrifos at 0.75 kg a.i./ha



21. Phadka grasshoppers

S.N: *Hieroglyphus banian*, *H. nigrorepletus*
(Acrididae:Orthoptera)

- The greatest amount of damage is caused during August-September when both adults and nymphs feed on paddy and other crops, causing defoliation
- In certain years, they cause extensive damage, moving from field to field over large areas.
- The nymphs and hoppers feed on the leaves leaving the midribs and stalks.
- At the shot blade stage of the crop they nibble at the florets or gnaw into base of inflorescence stalks causing formation of white ears.
- Dust carbaryl 5% or malathion 5% @ 25 kg per ha.



22. Rice grasshoppers

S.N: *Oxya nitidula*
(Acrididae:Orthoptera)

- Seasonal pest
- **Host range:** Rice and various other grasses
- Monovoltine pest.
- The hoppers hatch out in June - July from **eggs laid in the soil in batches of 30 to 40** eggs in the previous autumn, after the early rains, and generally mature during August- September.
- The adults then pair and lay the eggs at a depth of 5 cm in the soil during October-November, after which the grasshoppers die.
- The nymphal period occupies 10 to 14 weeks.



Damage and management

- The nymphs and hoppers feed on the leaves leaving the midribs and stalks.
- At the shot blade stage of the crop they nibble at the florets or gnaw into base of inflorescence stalks causing formation of white ears.
- Trimming of bunds.
- When the egg masses are exposed while trimming the bunds and also at the time of summer ploughings they are picked up by birds.
- Dusting quinalphos 1.5%D or malathion 5%D or spraying malathion 50%EC at 500ml/ha.



23. Rice skipper

S.N: *Pelopidas mathias*
(Hesperiidae: Lepidoptera)

- S.O.O. eggs singly on the leaf blades.
- The caterpillar is elongate with a green smooth body, a constricted neck and a red V mark on the head.
- The pupa is held by a girdle and is attached to the leafblade inside the leaf roll at its anal end.
- The adult butterfly is dark brown with two white spots on the fore wings.
- The larva folds the leaves longitudinally fastening the edges together and feeds on the green matter.



24. Rice horned caterpillar

S.N: *Melanitis leda ismene*
(Nymphalidae: Lepidoptera)

- S.O.O. round white eggs singly on the leaves.
- The caterpillar is green, slightly flattened with two red horn-like processes on the head and two yellow processes in the anal end.
- S.O.P. in a greenish chrysalis which suspends from the leaf.
- The butterfly is dark brown with large wings having a black and yellow eye-like spot one on each of the fore wings.
- The larva feeds on leaf blades of rice.



THANK
YOU