

ENTO 331 - CROP PESTS AND STORED GRAIN PESTS AND THEIR MANAGEMENT

Lecture No. 1

PEST OF RICE

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 sucking pests, BPH, GLH, WBPH, rice earhead bug pose severe threat to rice production.

Major pests				
1.	Thrips	<i>Stenchaetothrips biformis</i>	Thripidae	Thysanoptera
2.	Green leafhopper	<i>Nephotettix virescens</i> , <i>N. nigropictus</i> and <i>N. cincticeps</i>	Cicadellidae	Hemiptera
3.	Brown plant hopper	<i>Nilaparvata lugens</i>	Delphacidae	Hemiptera
4.	White backed plant hopper	<i>Sogatella furcifera</i>	Delphacidae	Hemiptera
5.	Rice earhead bug	<i>Leptocorisa acuta</i>	Alydidae	Hemiptera
6.	Mealy bug	<i>Brevennia rehi</i>	Pseudococcidae	Hemiptera
7.	Rice black bug	<i>Scotinophora lurida</i> and <i>S. coarctata</i>	Podopidae	Hemiptera
Minor pests				
8.	Earhead stink bug/ Shield bug / Red spotted bug	<i>Menida histrio</i>	Pentatomidae	Hemiptera
9.	Rice striped bug	<i>Tetroda histeroides</i>	Pentatomidae	Hemiptera
10.	White rice leafhopper	<i>Cofana spectra</i>	Cicadellidae	Hemiptera
11.	Blue rice leafhopper	<i>Empoasca maculifrons</i>	Cicadellidae	Hemiptera
12.	Zigzag striped leafhopper	<i>Recilia dorsalis</i>	Cicadellidae	Hemiptera

MAJOR PESTS

1. Thrips: *Stenchaetothrips biformis* (Thripidae: Thysanoptera)

Distribution and status: Bangladesh, India, Indonesia, Japan, Malaysia, Sri Lanka, Thailand and Vietnam. Minor but has potential to become major.

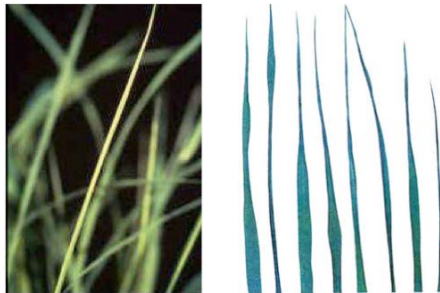
Host range: *Echinochloa* sp.

Damage symptoms

Both nymphs and adults lacerate the tender leaves and suck the plant sap, causing yellow or silvery streaks on the leaves of young seedlings. Terminal rolling and drying of leaves from tip to base is the typical symptom of attack. It causes damage both in nursery and main field.



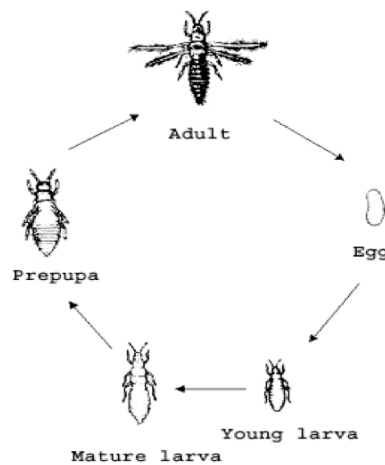
Leaf curling caused by Rice Thrips (IRRI)



ETL: 60 Nos. per 12 wet hand sweeps in nursery

Bionomics

Adults dark brown, female inserts the eggs singly within the leaf tissues in young leaves. Egg period 3-5 days, life cycle completed in 13-19 days.



Management

- Spray endosulfan 35 EC 80 ml or monocrotophos 36 WSC 40 ml/800 m² nursery.
- Spray Endosulfan 35 EC 1.0 L or Monocrotophos 36 WSC 1.0 L or Azadirachtin 0.15% w/w 1.5-2.5 L or Lambda-Cyhalothrin 2.5 EC 500 ml or Lambda-Cyhalothrin 5 EC 250 ml in 500 L water/ha
- Grow resistant cultivars like PTB 12, PTB 20, PT 321, H 4

2. Green leafhopper: *Nephotettix virescens*, *N. nigropictus* and *N. cincticeps* (Cicadellidae: Hemiptera)



Nephotettix virescens



N. nigropictus

Distribution and status: India, South Japan to oriental region, west of south Africa, Phillippines, Formosa, Sri Lanka

Host range: Rice, millets, grasses

Damage symptoms

Both nymphs and adults desap the leaves and cause “hopper burn” due to heavy infestation. Yellowing of leaves from tip downwards is the typical symptom caused by this pest. However, it is more important as a vector for rice tungro virus, rice yellow dwarf and transitory yellowing diseases.



ETL: 60 Nos. / 25 sweeping – Nursery

10 Nos. / hill - Flowering stage

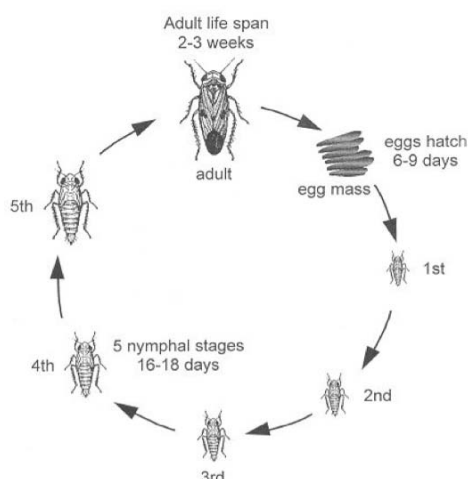
5 Nos. / hill - Vegetative stage

2 Nos. / hill - Tungro endemic area

Bionomics

Adults green with black spot and black patch on wings, gravid female inserts 200-300 eggs in batches of 8-16 in midrib of leaf blade. Egg period 6-7 days, nymphs undergo five instars and become adult in 25 days. Adult longevity 20-30 days. The population normally increases from August onwards, reaches maximum

during September - October and declines from November.



Management

1. Use resistant varieties like IR 20, IR 50, CR 1009, Co 46, PTB 2, PTB 18, IET 7301, IET 7302, IET 7303 and Vani, Vikra marka, Lalit, Nidhi
2. Nursery should not be raised near the lamp posts.
3. Apply neem cake @ 12.5 kg/800 m² nursery as basal dose.
4. Apply carbofuran 3 G @ 3.5 kg or phorate 10 G @ 1.0 kg or quinalphos 25 EC 80 ml or endosulfan 35 EC 80 ml per 800 m² nursery. Maintain the water level at 2.5 cm for 3 days after granular application.
5. Spray any of the following insecticide in 500 L water/ha
 - Acephate 75 SP 666-1000 g
 - Imidacloprid 17.8 SL 100 -125 ml
 - Endosulfan 35 EC 1000 ml
 - Quinalphos 25 EC 1000 ml
 - Buprofezin 25 SC 800 ml
 - Phosphamidon 40 SL 875 ml
 - Ethofenprox 10EC 500-750 ml
 - Thiamethoxam 25 WG 100 g
 - Fipronil 5 SC 1-1.5 kg or 0.3 GR 16.7 - 25.0 kg
 - Lambda-Cyhalothrin 2.5 EC 500 ml or 5 EC 250 ml
 - Fenobucarb (BPMC) 50 EC 500-1500 ml

3. Brown plant hopper: *Nilaparvata lugens* (Delphacidae: Hemiptera)

Distribution and status

Orissa, Andhra Pradesh, Tamil Nadu, Karnataka, West Bengal, Maharashtra, Madhya Pradesh, Uttar Pradesh, Haryana and Punjab in India, South East Asia, China, Japan, Korea

Host range: Rice, sugarcane, grasses

Damage symptoms

Nymphs and adults congregate at the base of the plant above the water level and suck the sap from the tillers. The affected plant dries up and gives a scorched appearance called “hopper burn”. Circular patches of drying and lodging of matured plants are typical symptoms caused by this pest. It is the vector of grassy stunt, ragged stunt and wilted stunt diseases.



ETL: 8-10 Nos./hill or 20 Nos./hill when spider is present at 1 No./hill

Bionomics

The brown plant hopper has a brown body and chestnut brown eyes. Adult measures about 4 - 4.5 mm in length capable of flying a long distance drifting with the wind. Adults are of two forms viz., macropterous (long winged) and brachypterous (short winged). The female makes an incision in the leaf sheath and inserts 200-300 small eggs, egg period -6 days; nymphal period - 15 days and adult longevity 18-20 days.



Management

1. Use resistant varieties like Aruna, Karnataka, Karthika, Krishnaveni, Makon, Abhey, Asha, Divya, Py 3, Co 42, Co 46, PTB 21, Jyoti (PTB 29) and PTB 33, Manasarowar, Bhadra, IET 7575, IET 6315, MTU 1249, R 650 - 1820, Shyraksha, Arvindar, kartik, bharatidasan, neela, uday, sonasali, vajram, chaitanya, nagarrjuna and chandana,
2. Avoid close planting and provide 30 cm rogue spacing at every 2.5 m to reduce the pest incidence.
3. Avoid use of excessive nitrogenous fertilizers.
4. Control irrigation by intermittent draining.
5. Set up light traps to monitor and control pest population.

6. Release of natural enemies like wolf spider, *Lycosa pseudoannulata* and green mirid bug *Cyrtorrhinus lividipennis*.
7. Avoid use of insecticides causing resurgence such as synthetic pyrethroids, methyl parathion, fenthion and quinalphos.
8. Drain the water before the use of insecticides and direct the spray towards the base of the plants.
9. Spray neem seed kernel extract 5% (25 kg/ha) (or) neem oil 2% (10 L/ha).
10. Spray imidacloprid 17.8 SL 125 ml or buprofezin 25 SC 325 ml or or acephate 75 SP 625 g or or /ha.

- | | |
|----------------------------------------------------------------------------------|--------------------------------------------------------|
| • Acephate 75 SP 665-1000 g | • Fenobucarb (BPMC) 50 EC
500-1500 ml |
| • Methyl demeton 25 EC 1000 ml | • Dichlorvos 76 WSC 350 ml |
| • Chlorpyrifos 25 EC 1250 ml | • Ethofenprox 10 EC 500-750 ml |
| • Benfuracarb 3 GR 3.3 kg | • Clothianidin 50 WDG 20-24 g |
| • Imidacloprid 70 WG 30-35 g
or 30.5 m/m SC 60-75 ml or
17.8 SL 100-125 ml | • Fipronil 5 SC 1.0 -1.5 L or 0.3
GR 16.7 - 25.0 kg |
| • Buprofezin 25 SC 800 ml | |

4. White backed plant hopper: *Sogatella furcifera* (Delphacidae: Hemiptera)

Distribution and status: India, Burma, Sri Lanka, China, Pakistan, Japan, Indonesia, Korea

Host range: Rice, maize, millets, sugarcane, grasses

Damage symptoms

Both nymphs and adults suck the sap and cause stunted growth and “hopper burn” leading to yield loss. “Hopper burn” is caused in irregular patches. Nymph falls on water keeping its legs stretched.

Bionomics

In white nymphs, vertex characteristically gives a narrow face to the hoppers. Forewings hyaline with dark veins and a dark spot in the middle of posterior edge. Pronotum pale yellow and adults possess a diamond like marking on the thorax. The

female lays upto 758 eggs in as many as 112 egg masses with 1-24 eggs in each in leaf sheath and in the mid rib of leaves. The ovipositional site characterized by black streaks. Egg period 6-7 days; nymphal period 12-17 days with five instars. The female longevity about 2 months.



Management

- Same as given for BPH.
- Use resistant varieties like AR 133, IC 25687, Tangner, Amelbero, HKR-10, HKR-126, IET 8116

5. Rice earhead bug: *Leptocorisa acuta* (Alydidae: Hemiptera)

Distribution and status: India and rice growing areas

Host range: Rice, Millets

Damage symptoms

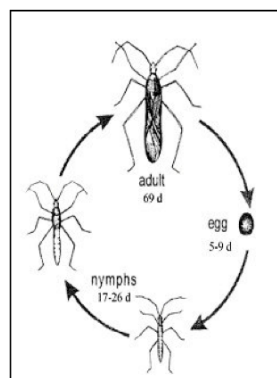
Both nymphs and adults suck the sap from individual grains at milky stage. Affected grains become chaffy with black spots at the site of feeding puncture. Yield loss may be 10- 40%. Obnoxious odour emanates on disturbing the bugs in the field.



Damaged grains caused by rice bug (IRRI)

ETL: 5 bugs/100 panicles or 1 bug/hill - flowering stage; 16 bugs/100 panicles or 3 bug/hill- milky stage.

Bionomics



Brownish green adults are slender with long legs and antennae, lay 200-300 flat, dark, reddish brown eggs in rows of 10-15 on the leaves or panicles. The egg period 5-8 days, green to brown nymphs undergo five instars in 17-27 days. Adults fairly long lived (30-50 days).

Management

1. Remove alternate host, *Echinochloa* from bunds and field.
2. Ensure synchronous planting on community basis in an area.
3. Use neem seed kernel extract 5% or notchi leaf powder extract 5% or *Ipomoea* leaf powder extract 5% or *Prosopis* leaf powder extract 5%
4. Dust quinalphos 1.5 D or carbaryl 10 D or malathion 5 D @ 25 kg/ha or spray malathion 50 EC 500 ml or monocrotophos 36 WSC 500 ml/ha.

6. Mealy bug: *Brevinnia rehi* (Pseudococcidae: Hemiptera)

Distribution and Status

Tamil Nadu, Andhra Pradesh, Karnataka, Orissa, Madhya Pradesh, West Bengal and Kerala in India, Bangladesh, Thailand

Host range: Rice, graminaceous weeds

Damage symptoms

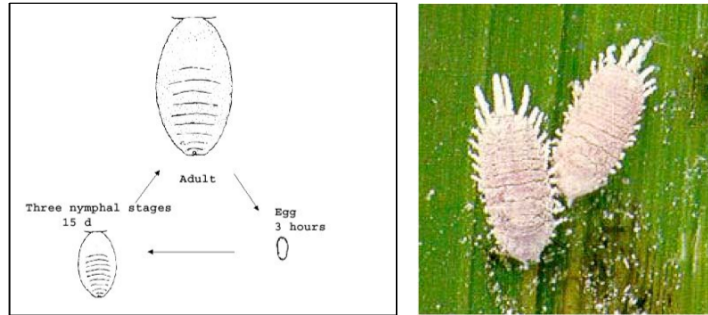
Large number of insects remains in leaf sheath and suck the sap, affecting plants in circular patches. Plants become weak, yellowish and stunted. Presence of white waxy fluff in leaf sheath is a typical symptom of damage.



Field damage caused by mealy bugs (IRRI)

Bionomics

The mealy bug is small reddish white, soft-bodied, wingless insect covered with filamentous materials. It lays 126-139 eggs in the leaf sheath and reproduces parthenogenetically. The egg period 1-2 days; nymphal period 17-34 days, nymphs remain within the leaf sheath and suck the plant sap.



Management

1. Parasitoids such as *Adelencyrtus* sp., *Xanthoencyrtus* sp. and *Dolichoceros* sp. and coccinellid predators can be utilized.
2. Remove the grasses and trim the bunds during the main field preparation before transplanting.
3. Remove and destroy the affected plants.
4. Spray dimethoate 30 EC 500 ml/ha in initial stages of infestation.

7. Rice black bug: *Scotinophora lurida* and *S. coarctata* (Podopidae: Hemiptera)

Distribution and Status: India

Host range: Rice, millets

Damage symptoms

Both nymphs and adults suck plant sap from the culm during tillering to flowering at the base of the plant. It also sucks the sap from leaf sheath, leaf and panicle. The affected plants turn reddish brown or yellow. During tillering stage, it causes drying up of central shoot (dead heart), stunted growth and reduced tillers. During reproductive stage, it affects the panicle development and causes chaffy grains (white ears). In severe cases, plants wilt, dry and turn bug burned, similar to hopper burn damage of brown plant hopper.

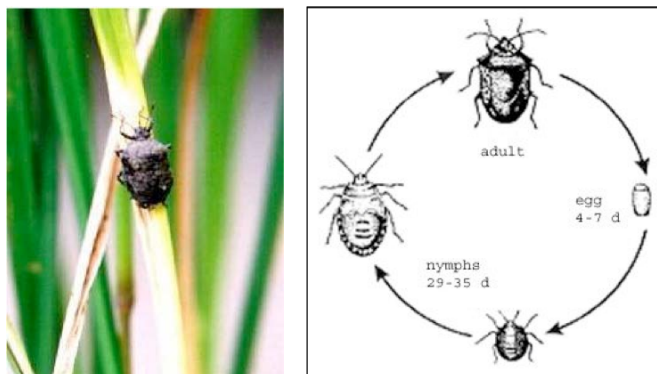


Bug burn (PhilRice)

ETL: 10% damage at tillering stage or 5 bugs / hill

Bionomics

Adults are brownish black with a prominent scutellum and pronotum having a spine on either side. 1 mm long greenish eggs are laid in masses on the stem and leaves that turn pinkish during hatching. Brown nymphs with yellowish green abdomen and 2-3 black scent glands.



Management

1. Keep the field free from weeds and grasses.
2. Drain the excess water from the field.
3. Set up light traps to attract and kill large number of bugs.
4. Conserve the predators viz., spiders, coccinellids and wasps to check the pest.
5. Ducks can be allowed in the field to pick up the bugs
6. Spray NSKE 5% or monocrotophos 36 SL @ 1000 ml/ha or acephate 75 SP @ 625 g per ha for effective pest suppression.

MINOR PESTS

8. Earhead stink bug / Shield bug / Red spotted bug: *Menida histrio* (Pentatomidae: Hemiptera)

Both nymphs and adults suck the ear heads and cause individual grains chaffy.



9. Rice striped bug: *Tetroda histeroidea* (Pentatomidae: Hemiptera)

The nymphs and adults suck the sap from the stem and cause stunting and

yellowing of tillers. Adult is brown with a prominent “V” shaped mark on its back. It lays cylindrical eggs in rows on the under surface of the leaves. The egg period 5-7 days, nymphal period 40-50 days, life cycle completed in 49-62 days. The adult longevity is about 2 weeks.

10. White rice leafhopper: *Cofana spectra* (Cicadellidae: Hemiptera)

Nymphs and adults suck the sap causing yellowing of leaves and stunting of tillers. Nymphs are elongate and pale green coloured. Adults are white in colour, 3-4 times larger than green leafhopper. They are the biggest of rice hoppers.

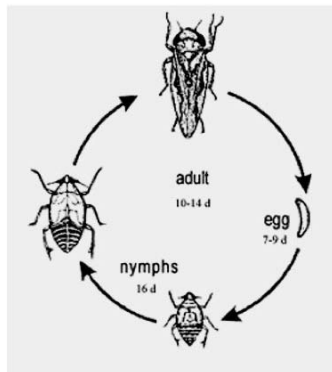


11. Blue rice leafhopper: *Empoasca maculifrons* (Cicadellidae: Hemiptera)

Nymphs and adults suck the sap of the leaves and cause “hopper burn” in the seedlings in the form of whitish waxy lines on the leaf blades in the initial stage of attack and subsequent drying. Small blue leafhoppers with yellowish vertex having a black patch in the middle of pronotum.

12. Zigzag striped leafhopper: *Recilia dorsalis* (Cicadellidae: Hemiptera)

Both nymphs and adults suck plant sap and cause tip drying and orange discoloration of both margins of leaves. Adults have white fore wings with pale brown bands forming the shape of W.



QUESTIONS

1	Terminal rolling and drying of leaves from tip to base in both rice nursery and mainfield.	
	a. Thrips	b. GLH
	c. WBPH	d. BPH
2	_____ acts as a vector for rice tungro virus	
	<i>Nephotettix nigropictus</i>	<i>Nilaparvata lugens</i>
	<i>Cofana spectra</i>	<i>Empoasca maculifrons</i>
3	ETL for GLH in tungro endemic area	
	a. 2 Nos/ hill	b. 5 Nos / hill
	c. 10 Nos / hill	d. 60 Nos / hill
4	Alternate host of <i>Stenchaetothrips biformis</i> is _____	
	a. <i>Phasalum scrobiculatum</i>	b. <i>Cyanodan dactylon</i>
	c. <i>Panicum</i> sp	d. <i>Echinochloa</i> sp.
5	Which of the following is white leaf hopper	
	a. <i>Nephotettix nigropictus</i>	b. <i>Cofana spectra</i>
	c. <i>Empoasca maculifrons</i>	d. <i>Nilaparvata lugens</i>
6	Which of the following is blue rice leaf hopper	
	a. <i>Nephotettix nigropictus</i>	b. <i>Cofana spectra</i>
	c. <i>Empoasca maculifrons</i>	d. <i>Nilaparvata lugens</i>
7	Hopper burn' is the symptom of _____ pest in rice	
	a. <i>Nephotettix nigropictus</i>	c. <i>Sogatella furcifera</i>
	b. <i>Nilaparvata lugens</i>	d. all the above

8	Use of synthetic pyrethroids may cause resurgence of sucking pest in rice Say True or false	
9	Tip drying and orange discoloration of rice leaves is typical symptom of -----	
	a. <i>Nephotettix nigropictus</i>	c. Recilia dorsalis
	b. <i>Empoascanara maculifrons</i>	d. <i>Nilaparvata lugens</i>
10	Which of the following pest causes damage to the grain at milky stage	
	a. Earhead bug	b. Mealy bug
	c. Black bug	d. Stink bug
11	----- act as a vector ragged stunt and wilted stunt.	
	a. <i>Nephotettix nigropictus</i>	b. <i>Empoascanara maculifrons</i>
	c. <i>Nilaparvata lugens</i>	d. <i>Cofana spectra</i>
12	----- ----- act as a vector for transitory yellowing diseases.	
	a. <i>Nephotettix nigropictus</i>	c. <i>Cofana spectra</i>
	c. <i>Empoascanara maculifrons</i>	d. <i>Nilaparvata lugens</i>
13	Zigzag striped leafhopper belongs to _____ family	
	a. Alydidae	c. Pentatomidae
	c. Cicadellidae	d. Delphacidae
14	Rice black bug belongs to _____ family	
	a. Alydidae	b. Pentatomidae
	c. Podopidae	d. Delphacidae
15	ETL for rice earhead bug in milky stage - 16 bugs/100 panicles or 3 bugs/hill.	
16	Green mirid bug which feeds on BPH ----- <i>Cyrtorhinus lividipennis</i>	
17	Alternate wetting and drying is a good management technique for controlling -----	

	a. BLH	c. GLH
	b. WBPH	d. BPH
18	Rice earhead bug belongs to _____ family	
	a. Alydidae	b.Pentatomidae
	c. Podopidae	d.Delphacidae