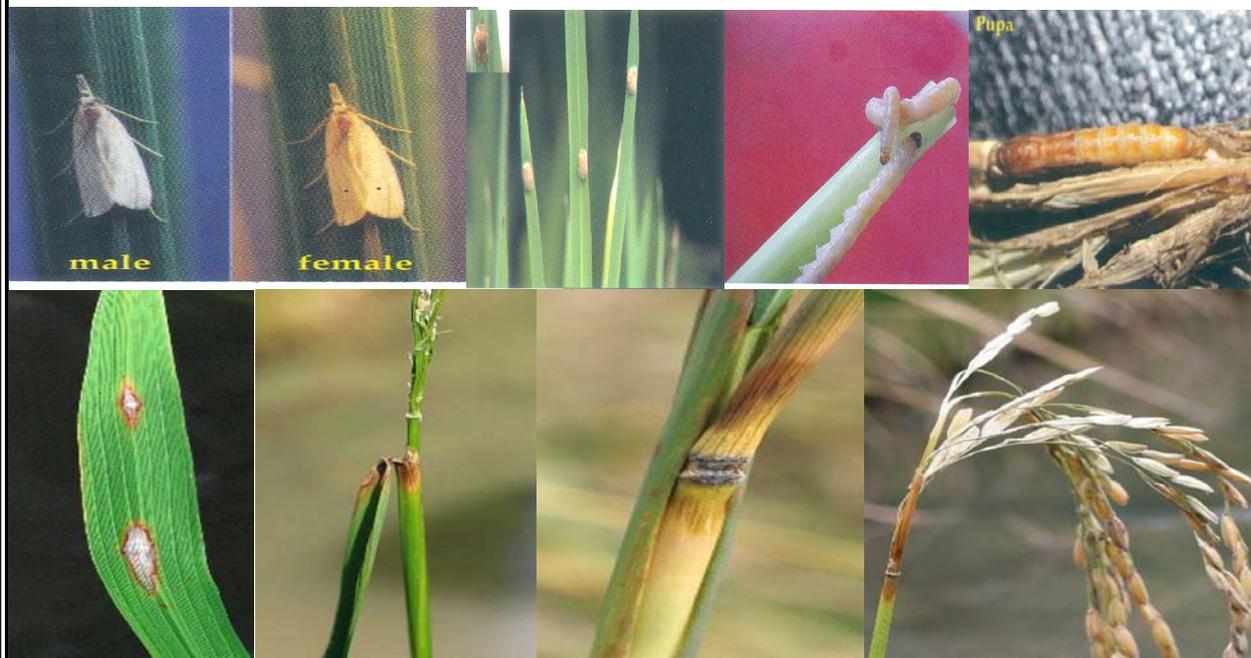


# INTEGRATED DISEASE PEST MANAGEMENT IN SRI PADDY



**SRI SECRETARIAT (SDTT)  
BHUBANESWAR**

## Introduction:

Pests have been associated with crops since times immemorial. But under changing environment their number has increased and the minor pests now become the major one causing greater damage to the crop. This is evident from the fact that rice crop had 3 major pests in 1965 which has increased to more than 15 in 2005. The greater incidence of disease pest leads to greater chemical application resulting in higher input cost and agro-ecological imbalance.

It is an established fact that SRI has low insect pest and disease incidence resulting in low or nil chemical pesticide application. Most of the SRI farmers are using organic pesticides as preventive measures or when the attack is below the threshold limit. However under changing environmental condition and indiscriminate chemical application to the rice crop in general, the pests have also developed resistance. In such circumstances there is a possibility of disease pest attack to SRI crop in greater proportions than earlier. Therefore, in order to avoid the disease pest attacks and ensure a healthy crop, the SRI farmers need to be acquainted with the rice pest, damage symptom caused by them and management options.

Here we have tried to focus on the causative organism, time and stage of attack, attack symptoms and different management options in the form of non-chemical and chemical treatment. The farmers are advised to practice the non-chemical managements unless and until the damage does not crossed the threshold limit. Apart from the pest wise management options, few ITKs that have been proved beneficial against certain disease pests are given in the end.

This material has been developed by the SRI Secretariat (SDTT), Bhubaneswar in consultation with Dr. P. K. Roul, Assoc. Professor (Agronomy) and Dr. H. P. Mishra Professor (Entomology) College of Agriculture OUAT, Bhubaneswar Orissa.

We hope the material will be useful for all the farmers in proper identification and management of disease pest of SRI paddy.

# Pests of Rice

## Stem borers

Stem borers are major pests of rice during both *kharif* and summer seasons. Five species of stem borers attack rice crop from which the yellow stem borer (YSB), *Scirpophaga incertulas* is dominant. The adult moth is slender, straw coloured with a pointed head. The female moth has a distinct black spot at the centre of fore wings. Caterpillar is yellowish white with orange coloured head.



Adult

Egg mass

Larvae

Pupa

Caterpillars cause the damage by feeding inside the rice stem causing “dead heart” or drying of the central whorl of leaf during the tillering stage. If the attack occurs during panicle formation or heading stage then “white ear heads” are formed and the whole panicle becomes chaffy. The loss varies from 3-96 per cent.



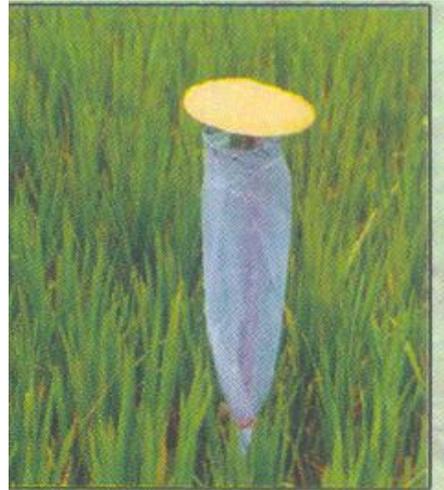
Dead heart



White Ear head

**Non chemical Management:** (1) Summer ploughing to expose resting stages of insects to heat of the sun and predators. (2) Early and synchronous planting. (3) Balanced fertilizer application. (4) Field sanitation to check carryover of pests. (5) Trap cropping

with Basmati rice in transplanted rice (9:1). (6) Avoidance of mono-cropping. (7) Growing stem borer resistant/tolerant varieties viz., Khandagiri, Ghanteswari, Udayagiri, Lalitagiri, Sidhant, Konark, Kharvela, Gajapati, Surendra, Pratikshya, Manika. (8) Strict surveillance of rice fields for pests and defenders. (9) Mechanical killing of adults and egg mass. (10) Setting up of light traps to attract and kill adults. (11) Setting up of bird perches @ 20-25/ha. (12) Setting up of pheromone traps for YSB @ 20-25/ha. (13) Release of *Trichogramma japonicum* against YSB @ 1 lakh / ha starting from 15 days after planting (DAP) at 7-10 days intervals 5-6 times. (14) Spraying of *Beauveria bassiana* product (Boverin, Biopower, Ankush, Daman, Biorin) @ 1kg/ha against YSB. (15) Spraying of *Bacillus thuringiensis* (*Bt*) based bio-pesticides available in the market (Dipel, Delfin, Biodart, Thuricide, Bioasp, Biolep, HIL *Btk*) @1kg or 1lit/ha. (16) Putting “karada”( *Cleistanthus collinus*) leaves in the field @ 200 kg/ha to get rid of YSB.



**Chemical Management:** (1) Seed treatment with fipronil (Regent) @ 25g/kg seed. (2) If the pest crosses economic threshold level (ETL) i.e.5% Dead heart (DH) or 1 egg mass per m<sup>2</sup> then apply cartap hydrochloride 4G @ 20kg/ha or fipronil 0.3G –25kg/ha or phorate 10G @ 10kg/ha or carbofuran @ 33 kg/ha or carbosulfan 6G @ 16Kg/ha in the main field. (3) Alternately spray with cartap hydrochloride 50SP -500g/ha/ fipronil(Regent) 5 SP –1 lit/ha/ monocrotophos/ quinalphos/ chlorpyriphos / phosphamidon / triazophos / profenophos – 1 lit/ha/ thiacloprid 240SP (Calypso) – 500ml/ha/ flubendiamide(39.35 SC) – 175ml/ha / indoxacarb14.5 SC – 200ml/ha.

## Gall midge: *Orseolia oryzae*

It is a serious pest of rice in tillering stage only. The adult is a small fly like a mosquito with yellow brown body and long dark brown hairy legs. The adult female is bright red with a reddish brown abdomen. The maggots are headless, legless and remain inside the basal part of the stem.



Adult



Eggs



Maggots



Silver shoots

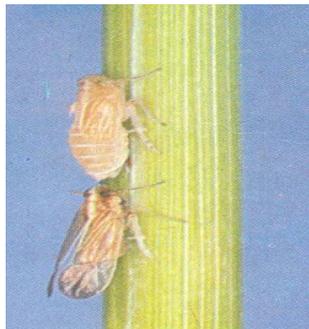
Feeding of the maggot at the growing primordia inside the growing stem and injecting a toxin “cecidogen” thereof results in a hollow tubular gall known as “silver shoot” which looks like onion leaf. Affected tillers do not bear panicles. Early infestation encourages profuse tillering and stunted growth of the plants. Damage varies between 8-50 per cent.

**Non chemical Management:** (1) Avoidance of mono-cropping. (2) Early and synchronous planting. (3) Field sanitation to check carryover of pests. (4) Growing tolerant/resistant varieties like Heera, Ghanteswari, Lalitagiri, Jogesh, Sidhant, Sebati, Bhoi, Gouri, Samalei, Konark, Kharavela, Lalat, Gajapati, Surendra, Jajati, Meher, Vijeta, Pratikshya, Manika, Savitree, Uphar etc. (5) Strict surveillance of rice fields for pests and defenders.

**Chemical Management:** (1) Sprouted seed soaked with imidacloprid 200SL @ 0.05% (2.5ml/lit) for 3 hours – then shade dried and broadcasted on raised nursery bed give protection against gall midge (2) When the pest crosses ETL i.e. 1 silver shoot (SS)/m<sup>2</sup> in endemic and 5% SS non-endemic areas then go for chemicals described for stem borer management. Besides, imidacloprid spray @ 125ml/ha is also effective.

## **Brown planthopper:** *Nilaparvata lugens*

In recent years it has become a serious pest of paddy during both *kharif* and summer seasons. High temperature and high humidity and luxuriant growth of the plants are congenial for its attack. The adults are light or dark brown in colour with short winged and long-winged forms in both the sexes. They are found in clusters at the base of the plants.



Brown planthopper adults



Hopper burn

Both nymphs and adults suck sap from the plant tissues. Excess draining of the plant sap results in wilting and drying of the plants in clusters known as “hopper burn”. It starts in circular patches and then covers the whole field.

**Non chemical Management:** (1) Early and synchronous planting. (2) Use of balanced fertilizer dose and avoid using excessive ‘N’ fertilizer or manure. (3) Alternate wetting and drying of the rice field. (4) Use resistant/tolerant rice cultivars e.g. Lalat, Sebati, Konark, Surendra, Tapaswini, Meher, Vijeta, Durga, Rambha, Kanchan etc. (5) Strict surveillance of rice fields for pests and defenders (mirid bugs and spiders). (6) Setting up of yellow sticky traps to attract and kill hoppers. (7) Foliar spraying of NSKE @5% or neem oil 0.5% or neem based commercial pesticides 300ppm @ 2.5lit/ha (Margocide OK 80%EC, Achook,



Nimbecidine, Bioneem, Neemark, Neemgold, Neemax, Rakshak, Econeem, Limonool, Repelin, Ozoneem Trishul, Multineem etc.). (8) Keeping alley ways in BPH endemic areas.

**Chemical Management:** (1) Do not apply resurgence causing insecticides like quinalphos, chlorpyrifos, methyl parathion, deltamethrin and cypermethrin. (2) When BPH population crosses ETL (5-10 insects/hill) apply any of the following insecticides as foliar spray (thiamethoxam – 100g/ha, imidacloprid –125ml/ha, ethiprole 10EC – 500ml/ha, clothianidin 50WDG – 60g/ha, bifenthrin (Talstar) 10EC -250ml/ha, BPMC (Fenobucarb) 50EC –1lit/ha, buprofezin 25%WP (Applaud, Buprolord) – 300 to 500ml/ha) or imidacloprid 0.2G – 25kg/ha in the main field.

### **White-backed planthopper:** *Sogatella furcifera*

It causes serious loss in the vegetative stage of the crop. The adults are brown to black in colour with yellow bodies and conspicuous dorsal white band on the thorax between the wings from which the pest derived its name. Males are long winged and females have both short and long wings.



Adults and nymphs suck the sap remaining at the basal part of the plants. As a result of which the leaves turn yellow and later on rust red. High population gives a burning appearance to plants looking orange-yellow which later dry up and turn brown.

**Non chemical Management:** (1) Use resistant/tolerant varieties like Ramachandi, Mahanadi, Prachi or Indravati. (2) Others same as non chemical management suggested for BPH.

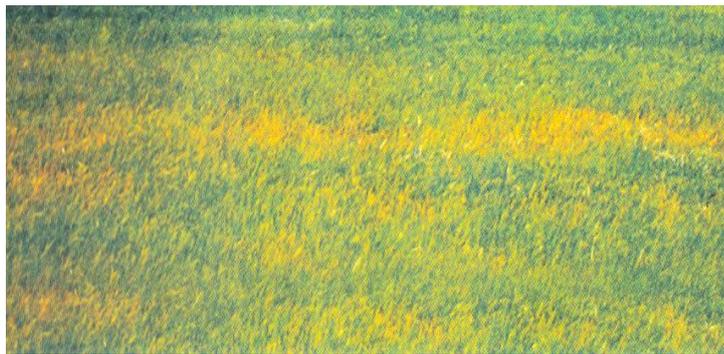
**Chemical Management:** (1) When WBPH population crosses ETL (5-10 insects/hill) apply any of the insecticides as suggested in case of BPH.

### **Green leafhopper:** *Nephotettix virescens*

The adults are pale green with black markings on the head and wings. They are active during day and night and walk side-wise; when disturbed they quickly jump from the leaf blade. The adult have two black spots at the centre of the fore wings.



Green leafhopper adults



Tungro disease affected rice field

Both nymphs and adults suck the sap from the leaves and tillers with their sucking mouth parts resulting yellowing of the leaves which later become brown and dry up from the tip downwards. Apart from direct feeding both nymphs and adults act as vectors of rice tungro virus disease. It is a serious pest in Kharif season.

**Non chemical Management:** (1) use resistant/tolerant varieties like Heera, Pathara, Badami, IR-36, Navin, Lalat, Rambha, Kanchan, Parijat, Srabani, Moti, Tulasi etc. (2) Others same as non chemical management suggested for BPH.

**Chemical Management:** (1) When GLH population crosses ETL (5-10 insects/hill, 2 insects / hill in Tungro endemic areas) apply any of the insecticides as suggested in case of BPH.

**Leaf-folder:** *Cnaphalocrocis medinalis*

It has assumed the major status of a pest in all types of rice cultivation during both the seasons. The adult moth is yellowish-brown with dark or light-brown wavy markings on the fore wings. It looks like a triangle when rest on leaves. Larva when full grown found inside folded leaves, light green in colour with reddish-dark head and one inch in length.



Adult



Eggs



Larva



Pupa

Young larvae feed on the leaf tissues and as they become older fold the leaf blade from both sides to form a tube. They feed by scrapping the green matter remaining inside the leaf fold. In severe infestation, the folded leaves entirely dry up and give a scorched appearance. Damage appears as white feeding areas in a field.



Damaged plant

**Non chemical Management:** (1) Avoidance of mono-cropping. (2) Use of balanced fertilizer dose and avoid using excessive 'N' fertilizer or manure. (3) Strict surveillance of rice fields for pests and defenders. (4) Mechanical killing of larvae of leaf folders (LF) by collecting and destroying affected leaves. (5) Setting up of light traps to attract and kill adults. (6) Release of egg parasitoid *Trichogramma chilonis* @ 1 lakh / ha starting from 15 Days after planting(DAP) for 5-6 times at 7-10 days intervals. (7) *Bacillus thuringiensis* (*Bt*) based commercial bio-pesticides may be sprayed @1kg or 1lit/ha (Dipel, Delfin, Biodart, Thuricide, Bioasp, Biolep, HIL *Btk*) at 7-10 days intervals in the evening hours. (8) Foliar spraying of NSKE @5% or neem oil 0.5% or neem based commercial bio-pesticides 300ppm @ 2.5lit/ha or 1500 ppm @ 1.5lit./ha. (9) Dragging a rope across the field to dislodge larvae of leaf-folder to kerosenized water in the field. (10) Putting "karada"(*Cleistanthus collinus*) leaves @ 200 kg/ha in the field.

**Chemical Management:** (1) Avoid use of broad spectrum insecticides. (2) Avoid use of resurgence causing insecticides like carbofuran 3G and phorate 10G. (3) When the pest crosses ETL i.e. 2 freshly damaged leaves/hill then apply monocrotophos/phosalone/ triazophos/ profenophos/ flufenoxuron 10DC/ lambda-cyhalothrin 2.5EC (Kung Fu, Bravo, Tata Reeva) @ 1 lit/ha or cartap hydrochloride 50 SP – 500g/ha or fipronil 5 FS – 1 kg/ha or lambda-cyhalothrin 5EC (Karate) –500 ml/ha or flubendiamide(39.35 SC) – 175ml/ ha or indoxacarb14.5SC – 200ml/ha.

### **Case worm:** *Nymphula depunctalis*

The pest is more prevalent in water-logged and rainfed wetland areas. The adult moth is small, snow white with light brown black spots on the wings. Caterpillars are pale green in colour with a light brown head.



The larvae live in tubular cases made up of cut portions of paddy leaves around their bodies made with a silken thread. Water is trapped inside the case to maintain humidity and the larvae protrude their head from the upper part of the tubular cases. They feed by scrapping patches of leaf tissue leaving behind papery epidermis. The cases float in water to spread the attack to other plants of the same and other fields.

**Non chemical Management:** (1) Do not allow standing water in the field. Drain out standing water. (2) Mechanical killing of larvae of case worm by straining running water from the field. (3) Dragging a rope across the field to dislodge larvae of case worm to kerosenized water in the field. (4) Putting “karada”( *Cleistanthus collinus* ) leaves in the field @ 200 kg/ha.

**Chemical Management:** (1) When the pest crosses ETL i.e. 1-2 cases/hill give foliar sprays with endosulfan / monocrotophos / chlorpyrifos 50% + cypermethrin 5% @ 1 lit./ha.

### **Gundhi Bug:** *Leptocorisa acuta*

It is a serious pest of upland rice during milky stage. The adult bug is slender, brownish green in colour measuring about 15mm in length with long slender legs and four segmented antennae. The nymphs are green to brown in colour.



The nymphs and adults are active during early morning and late afternoon feeding on the milk of the rice during the milky stage. The area around the puncture hole turns brown. The puncture hole serves as a point of entry of several pathogens which cause grain discolouration. Affected grains in the panicle become chaffy. Attack in dough stage causes shrivelled grains.

**Non chemical Management:** (1) Keep fermented snail or crab bait @ 20-25/ha to attract and divert pests from sucking milk of rice grain. (2) The extract of 2.5kg garlic + 500g tobacco leaves + 500g washing powder sprayed over one hectare area during milky stage of rice controls 80% gundhi bug.

**Chemical Management:** (1) When the pest crosses ETL i.e. 1 bug/ hill then give spray with DDVP – 500ml/ha/ carbaryl – 2 kg/ha/ abamectin – 500ml/ha/ phosphamidon 40SP –1 lit/ha or dusting with malathion 5%D @ 25kg/ha.

### **Mealy Bug:** *Brevenia rehi*

It is a serious pest when transplanted rice fields under SRI remain dry. The females are soft bodied, wingless and pink coloured insects covered with white waxy mealy mass.

Both nymphs and adults suck plant sap remaining stationary on the stem beneath the leaf sheath at the base of the plants. As a result the plants turn yellow and become stunted. Damage occurs in patches with yellowish curled up leaves and



chaffy earheads. Dry spell favours population built up and damage under drought conditions becomes high.

**Non chemical Management:** (1) Give frequent irrigation if possible SRI norms. (2) Weed out the graminaceous weed hosts from the field. (3) Give intra row manual hoeing or with weeder. (4) Mechanically collect the affected plants and use as cattle feed or sun dry.

**Chemical Management:** (1) Give foliar spray of dimethoate – 1 lit/ha or thiamethoxam – 100g/ha or imidacloprid –125ml/ha.

### Swarming caterpillar (Army worm):

*Spodoptera mauritia*

Swarming caterpillars are cut worms which appear in wetland rice after the floods recede. The adult is a stout, medium-sized grey brown moth with black spots on the fore wings. The hind wings are white. The caterpillar is light brown in colour with three longitudinal pale brown or yellowish red stripes over the body.



The caterpillars feed on the leaves and tender shoots of rice plants by completely defoliating it. They are active during late afternoon, night and early morning. During day time they hide themselves under leaves of grasses, cracks and crevices in the field bunds. In severe cases the field appears as if grazed by cattle's. They migrate from one field to another enmass when food in one field is over.

**Non chemical Management:** (1) Strict surveillance of rice fields for appearance of the pests. If the population is less than 1 larva/hill then (i) spray with *Beauveria bassiana* product (Boverin, Biopower, Ankush, Daman, Biorin) @ 1kg/ha or (ii) *Bt* based bio-pesticides available in the market may be sprayed @1kg or 1lit/ha or (iii) Give foliar spraying of NSKE @5% or neem oil 0.5% or neem based bio-pesticides 300ppm @ 2.5lit/ha or 1500 ppm @ 1.5 lit/ha. (2) Set light traps to attract and kill adults.

**Chemical Management:** (1) When the pest crosses ETL i.e. 1 larva/ hill then spray with endosulfan / chlorpyrifos / triazophos/ profenophos –1 lit/ha and dust the field bunds heavily with methyl parathion 2%D, chlorpyrifos 1%D, malathion 5%D, quinalphos 1.5%D - 25 to 30kg/ ha. Pesticide application should be done in the evening hours.

**Climbing cut worm:** *Mythimna separata*

It is a pest of sporadic occurrence but serious in ripening stage of the crop. The adult moth is pale reddish brown in colour. Fore wings have two round spots and hind wings are dark on the top. The caterpillar is orange or brown in colour. Four longitudinal light grey or black stripes run along the greenish pink body.



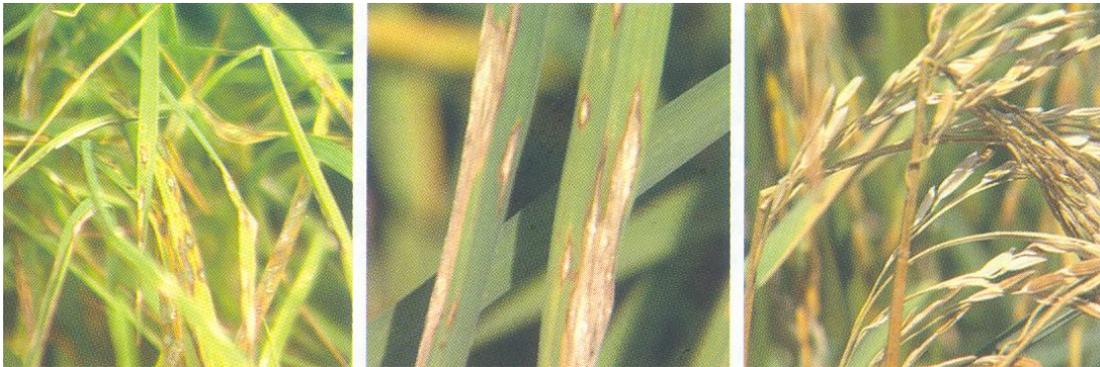
The caterpillars attack the crop during the earhead ripening stage. They climb the plants and cut off the earheads during night and feed on the leaf margin. Pellets of excreta together with cut earheads and spikelets are seen on the ground under the plants.

The chemical and non-chemical management practices followed for the pest are same as described under swarming caterpillar.

## Diseases of Rice

### **Blast:** *Pyricularia grisea*

It is a severe fungal disease. Typical spindle shaped leaf lesions, wide at centre and pointed toward either end are seen. In severe cases they coalesce and the leaves die. Neck and panicle infection causes chaffy and shriveled grains. The node becomes black and breaks at joints. Panicles dry up and break down before harvest. It occurs during both *kharif* and rabi season. Lower night temperature and high humidity favour the disease incidence.



**Leaf blast**

**Neck blast**

**Non Chemical Control:** (1) Do Summer ploughing to eliminates many soil borne fungi. (2) Grow tolerant/resistant varieties *viz.*, Heera, Khandagiri, Ghanteswari, Sebati, Udayagiri, Bhoi, Kharavela, Srabani, Lalat, Gajapati, Surendra, Meher, Mahanadi, Indravati, Jagabandhu, Rambha, Kanchan wherever available. (3) Avoid using high doses of nitrogenous manures/ fertilizers. (4) Maintain rice fields free from weeds which give shelter to many pathogens. (5) Destroy crop residues and stubbles of previous crop to eliminate source of inoculum. (6) Go for early planting. (7) Use leaf extract of bael or tulsi @ 250g in 10 litres of water and spray 3-4 times at an interval of 7-10 days. For one ha 500 litres of such spray formulation is required.

**Chemical Control:** (1) Treat seeds with captan / thiram / Vitavax power @ 2g or carbendazim @ 1.5g/kg seed. (2) Spray the crop 2-3 times at an interval of 10-12 days with edifenphos (Hinosan) @ 500ml/ha or kasugamycin (Kasu B) @ 1 lit/ha or tricyclazole 75 WP (Beam,Gain, Blast off, Logic, Veer, Force 11, Sivic) @ 250-300g/ha.

## **Brown spot:** *Bipolaris oryzae*

Typically ellipsoidal, oval to circular lesion on the coleoptile, leaf blade, leaf sheath and glume, measuring about 2-8mm X 0.5mm are seen which coalesce in severe infections. Light brown grey centre with dark or reddish brown margin, blackened grains, characteristic burnt and scorched appearance of field in advanced stage are the identifying symptoms. The disease is air borne. High humidity and warm temperatures favour the disease spread.



**Non Chemical Control:** (1) Use disease free and resistant/tolerant varieties viz., Pathara, Khandagiri, Udayagiri, Lalitagiri, Badami, Sebati, Bhoi, Konark, Kharavela, Gajapati, Surendra, mahanadi, Indravati, Ramachandi, Savitree, Rambha, Kanchan. (2) Destroy crop residues and stubbles of previous crop. (3) Avoid using high doses of nitrogenous manures/ fertilizers. (4) Emphasis should be given on phosphorous availability to rice crop because, the brown spot disease incidence is more in “P” deficient soils.

**Chemical Control:** (1) Treat seeds with captan / thiram / Vitavax power @ 2g or carbendazim @ 1.5g/kg seed. (2) Spray the seedlings as well as transplanted crop with mancozeb/copper oxychloride @ 1250g/ha or carbendazim/ contaf @ 500g/ha.

## **Bacterial leaf blight (BLB):** *Xanthomonas campestris* pv. *oryzae*

It is a highly destructive bacterial disease. Straw to yellow coloured undulating lesions appear on leaf tip region and margins which move downwards through leaf veins in a typically wavy manner. In severe cases leaves roll up, turn grey, foliage withers and plants die. In matured plants panicle dry up with chaffy grains. Occurrence of the disease in nursery creates patches of wilted plants called “Kresak” phase of the disease.



High humidity, splashing rains and high temperature predisposes the rice crop to heavy infection.

**Non Chemical Control:** (1) Use disease free and resistant/tolerant varieties viz., IR-36, Lalat, Tapaswini, Padmini, Kanchan, Gayatri, Durga. (2) The BLB infected field should be kept well drained and avoid water stagnation soon after infection is detected. (3) Apply potassic fertilizer in two split doses at tillering and pre-flowering stages. (4) Avoid using high doses of nitrogenous fertilizers. Go for judicious application. (5) Use fresh cow dung slurry @ 2kg/10 litres of water, strain it in fine cloth and spray at an interval of 7-10 days 3-4 times for BLB control @ 500 litres/ha.

**Chemical Control:** (1) Soak the seeds with a solution of plantomycin 10g/streptocyclin 1.5g and copper oxychloride 25g in 10 litres of water. (2) Spray the affected crop with the same chemicals @ 500 litres /ha at 7-10 days intervals 2-3 times on need basis.

### **Sheath blight:** *Rhizoctonia solani*

It is a widely distributed fungal disease appearing late in the season. The symptoms first appear on lower leaves near the water level during tillering stage with lesions which are oblong or elliptical greenish grey in colour, water soaked and about 1cm in length. These lesions have regular dark brown border and grayish central region. Similar symptoms also appear on the foliage. Infected plants produce chaffy grains. Brown mustard shaped sclerotia appear in affected area. The disease is more severe in *kharif* season. High humidity and warm temperature favours the disease. It is both a soil and seed-borne disease.



**Sheath rot**



**Sclerotial bodies  
Sheath blight**



**Affected leaf sheath  
Sheath blight**

**Non Chemical Control:** (1) Use resistant/tolerant varieties *viz.*, Naveen, Jagabandhu, Manika, Khandagiri, Ghanteswari, Udayagiri, Jogesh, Rambha, Pratikshya, Kanchan, Uphar. (2) Remove weeds and crop residues with deep ploughing. (3) Seed treatment with *Pseudomonas fluorescens* powder @ 10g/kg of seed. (4) Seedling root dip with *P. fluorescens* powder @ 20g/lit of water for 1 hour before transplanting. (5) Foliar spray of *P. fluorescens* powder @ 1 kg/ha at 10 days intervals. (6) Spray azadirachtin(1500ppm) @ 2.5 lit/ha. (7) Apply neem cake @ 2.5 quintal /ha.

**Chemical Control:** (1) Spray with propiconazole (Tilt / Result 25EC) @ 500ml/ha or validamycin (Sheathmar/Rhizocin 3 L) @ 1.5 lit/ha.

**Sheath rot:** *Sarocladium oryzae*

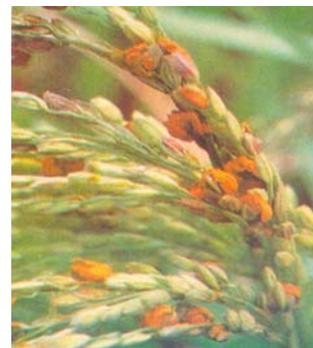
The fungal disease affects the crop in mature stage during *kharif* season. The disease appears on the uppermost leaf sheath. The spots are oblong to irregular with grey centre and brown margin. Severe infection causes poor exertion of panicles and poor grain setting. The yield sometimes is reduced to 75 per cent. High humidity and temperature between 17-20°C during flowering time favours the disease incidence.

**Non Chemical Control:** (1) Use resistant/tolerant varieties *viz.*, Lalitagiri, Kharavela, Gajapati, Surendra, Swarna, Pratikshya, Mahanadi, Indravati, Jagabandhu, Ramachandi, Durga. (2) Destroy crop residues and stubbles of previous crop to eliminate source of inoculum. (3) Apply neem cake @ 2.5 quintal /ha.

**Chemical Control:** (1) Treat the seeds with carbendazim @ 2g/kg. (2) Spray with carbendazim @ 750g/ha in 500 litres of water two times at 10 days intervals during flowering stage.

**False smut:** *Ustilaginoidea virens*

The fungal disease is found in the ear head only. Individual grains are transformed initially into large velvety orange yellow balls which later turn dark green or almost black. Few grains in a panicle are usually infected. The disease is more severe in *kharif* season. Primary infection is through soil borne inoculum.



**Non Chemical Control:** (1) Grow resistant/tolerant varieties viz., Bala, Cauveri, Sabarmati, Prakash, Pankaj, Shakti, Vijaya, Mashuri. (2) Destroy crop residues and weeds.

**Chemical Control:** (1) Treat the seeds with thiram @ 3g or carbendazim @ 1.5g or vitavax power @ 2 g/ kg seed before nursery sowing. (2) Spray at boot leaf stage twice at 7 days interval with copper oxychloride @ 1 kg/ha in 500 litres of water.

### **Udbatta disease:** *Ephelis oryzae*

Sometimes during the panicle emergence stage the infected panicle get matted together by mycelium of the fungus while still inside the leaf sheath and emerge as a single, mummified, erect and compact grayish-white cylindrical rod or stick looking like an “agarbatti”. The plants do not bear normal ear head.



**Non Chemical Control:** (1) Treat seeds for 10 minutes in hot water at 54°C before sowing in nursery. (2) Do not collect seeds from affected fields. (3) Sun dry seeds during summer months for 5 days. (4) Sow seeds early to reduce incidence of the disease.

**Chemical Control:** (1) Treat the seeds with benlate @ 2.5g or vitavax power @ 2g/ kg.

### **Root knot nematode:** *Meloidogyne graminicola*

The nematode attacks the rice plants when the soil becomes dry in nursery / early growth stage of SRI. The leaves become orange yellow, later turning dry resulting in yellow patches in the field. Affected plants show galls on the roots.



**Infested root (Knots on roots)**



**Infested field**

**Non Chemical Control:** (1) Grow resistant/tolerant varieties like TKM 6, Daya, Ptb 10 and Udaya. (2) Amendment of soil with water hyacinth compost. (3) Application of neem cake @ 2.5 quintal /ha. (4) Destruction of weeds is helpful. (5) Crop rotation with groundnut, jute, wheat, potato and black gram reduces incidence.

**Chemical Control:** (1) Treat the nursery soil with carbofuran 3G @ 33 kg/ha of nursery area before seeding. (2) Apply carbofuran 3G @ 33 kg/ha in the main field if the nematode appears.

**White tip nematode:** *Aphelenchoides besseyi*

The nematode is seed borne and can survive in dry seed for two years. It can spread through seedlings and irrigation water. It is parasitic on aerial parts of the rice plants. As a result the upper 2-5cm leaf tip turns white or pale yellow in colour which changes to brown. Flag leaves are characteristically shortened and twisted in the apical region with loss of vigour, stunted growth and emergence of smaller panicles. The affected plants become sterile, produce distorted glumes and deformed grains. Nematode remains between grain and husk to be carried to the next generation.



**Non Chemical Control:** (1) Grow resistant/tolerant cultivars like Ratna, Sona, Bala, Annapurna, Krishna, TKM 6 etc. (2) Hot water treatment of seeds at 52°C for ten minutes after pre soaking, for six hours kills the white tip nematodes. (3) Sun drying of seeds for six hours for consecutive four days in April-May also kills white tip nematode remaining in the seed. (4) Keep the rice fields free from weeds.

**Chemical Control:** As suggested in case of root knot nematode.

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N.B.- The Pest/Disease resistant/tolerant paddy varieties referred above are mostly cultivated and readily available in the coastal states of eastern India.

## **FEW ITKs USED FOR DISEASE PEST CONTROL**

### **PANCHAGAVYA.**

#### **Materials required:**

- a. 1 Kg Cow dung.
- b. 2 litres Cow urine.
- c. 1 litres Cow milk
- d. 1 Litre curd.
- e. 250 ml cow ghee.

#### **Preparation procedure**

All the above materials are taken in the given proportion and thoroughly mixed in an earthen pot for at least one hour. This mixture is further diluted by 150-175 litres of water and applied to the paddy crop. For short and medium duration variety Panchagavya is applied at 15 and 45 days of the crop and for long duration variety in addition to the above two times it is also applied at 75 days of the crop.

#### **Action**

Panchagavya promotes the plant growth and offer resistance towards disease.

### **MATKA KHAD**

#### **Materials required:**

- a. 1 Kg Cow dung.
- b. 2 litres Cow urine.
- c. 50 gm jaggery.
- d. Earthen pot

#### **Preparation procedure**

All the above materials are taken in the given proportion and thoroughly mixed in an earthen pot for at least one hour. The pot is covered by polyethylene cover and is kept airtight for 10 days. At every two days interval the mixture is stirred with a stick. After 10 days the mixture is filtered by a thin cloth and applied to the crop by diluting upto 40 times with water. The above extract may be sprayed by using a wide mouth nozzle or sprinkled through broom. Un filtered matka khad may also be applied directly to the water channel.

#### **Action**

Matka khad promotes the plant growth.

## **MEDICINAL MATKA KHAD**

### **Materials required:**

- a. 1 Kg Cow dung.
- b. 2 litres Cow urine.
- c. 1 kg neem leaf
- d. 1 kg karanj leaf
- e. 1 kg *Calotropis* leaf
- e. 50 gm jaggery.
- f. Earthen pot

### **Preparation procedure**

All the three types of leaves are grinded or chopped and added to the mixture of cow dung and urine. After adding jaggery the whole mixture is stirred thoroughly. The pot is airtight by a polythene sheet and kept in a shade place. The mixture is stirred at an interval of 2-3 days. After 10-15 days the above mixture is ready for use. The application procedure is same to that of matka khad. Like matka khad the medicinal matka khad can be applied to the crop by either spraying through a wide mouth nozzle sprayer or by sprinkling with a broom.

### **Action**

Medicinal Matka khad has a multifarious function. It is effective against almost all types of plant disease and pest. It can also be used for seed treatment and promotes plant growth.

## **BRAHMASTRA**

### **Materials required:**

- a. ½ litre Neem oil.
- b. ½ litre tobacco leaf soaked water.
- c. 100 gm Asafoetida(Hingu).
- d. 6 litres cow urine.
- e. 500 gm garlic paste.
- f. 250 gm each of chilli and ginger paste.

### **Preparation procedure**

½ litre of Neem oil, ½ litre of tobacco leaf soaked water and 100 gm of Asafoetida (Hingu) is thoroughly mixed with 6 litre of cow urine. Along with the above mixture 500 gm garlic paste, 250 gm of chilli paste and 250 gm of ginger paste is mixed with the above mixture and kept undisturbed for six hour. 50 gram of soap powder is added to 100 litres of water in another container. Now the previously prepared mixture is mixed with the soap water and Brahmastra is prepared.

This Brahmastra is applied to the crop at 15 and 40 days after transplanting.

### **Action**

It acts as an unfailed weapon effective against variety of diseases and insect pests in almost all types of crops.

### **GARLIC, TOBACCO AND CHILLI MIX**

#### **Materials required :**

- a. Garlic Paste 250 gm
- b. Tobacco paste 250 gm
- c. Dry chilli powder 250 gm
- d. Neem Oil 1.5 litre
- e. Soap powder
- f. Covered jar or plastic bucket.

#### **Preparation procedure**

1.5 litre of Neem oil is taken in a glass jar/plastic bucket. Garlic paste, Tobacco paste and dry chilli powder is added. The mixture is thoroughly stirred and kept air tight for 3 days. After 3 days the mixture is ready. 4 gm of soap powder is added to 1 liter of water in which 5ml of the above filtrate is added and mixed thoroughly.

The mixture is sprayed in the morning hour to the crop at 15 days interval.

#### **Action:**

It is effective against most of the leaf cutting pest, sucking pest, stem borer and some bacterial and fungal disease as well.

### **CUSTARD APPLE, NEEM, CHILLI EXTRACT**

#### **Material Required**

- a. Custard apple leaf – 2 Kg
- b. Dry chilli – 500 gm.
- c. Neem fruit -1 Kg
- d. Emulsifier -250 ml

#### **Preparation procedure**

- Take 2 Kg of custard apple leaves and grind well. To this, add 500 ml of water, mix it well and filter the extract. Keep the filtrate aside.
- Take 500 grams of dry chilli and soak in water over night. The next day, grind it and filter the solution to get the extract.
- Take 1 kg of crushed neem fruits and soak in 2 litres of water overnight. Filter the extract the next day.

Mix all three filtrates with 50-60 litres of water. To this, add 250 ml of emulsifier before spraying. Filter it again and spray.

### **Action**

It is effective against Brown plant hopper, Caterpillar, green leaf hopper etc.

## **CONTROL OF FIELD RATS**

The following methods can be adopted for control of field Rats in the paddy field.

- To manage rodents, flowers of glicirdia are scattered in the rat infested fields. It is believed that when the rodents touch the flowers or nibble at them they get paralyzed for sometimes and are not able to cause any damage to the crop. Thus, they are managed naturally with the locally available inputs.  
This practice has been successfully practiced by the farmers of Ahmadnagar district and they assured that the taste, smell and fluid of the fresh flowers acts as rodent repellent.
- Try to catch a field rat. Keep it for two day with out any food. On the 3<sup>rd</sup> day dip it in a colored solution (So that the rat become coloured) and leave it in the same field, if possible near the rat hole.
- As we know cats and foxes are the enemy of rats. Collect the excreta of cats/fox and keep it at different place in the field on the surface of leaf. Anticipating the presence of enemy the rats will leave the field.
- Put stack of neem/karanj at regular intervals in the field. This will be a platform of the flying birds to sit and eat different pests from the field. In the night the owl will sit on it and control the rats.

## **Control of BPH in Rice**

### **Light lures insects**

A new method of protecting paddy from the brown plant hopper has been developed by a progressive organic farmer of Karnataka. At night time, two torch lights are beamed in a 'v' shape in the centre of the paddy field. The person holding the torches walks from the centre to the edge of the field. The insects are attracted to the light and attempt to follow it. Thus, they leave the paddy field. This process is repeated for two to three days in succession and the population of BPH is reduced.

### **Bund fire**

Brown plant hopper and green leaf hoppers can also be controlled by lightning fire on the field bund in the evening. The above pests are attracted by the light and are killed in the fire.

### **Termite control by Herbal Pesticides**

To control termite in the field some farmers cut approximately 5 kg each of *calotropis* and Kheemp (*Leptadenia pyrotechnica*) twigs into small pieces and put them in an earthen pot. Then add 1 kg salt and 10 ltr water/cow/human urine. The pot is kept in a pit for 15-20 days. The suspension is filtered through cotton cloth and filtrate is applied as an insecticide @ 10 ltr/ha in irrigation channel.

### **Control of Swarming Caterpillar**

Paddy at grain filling stage when infested with swarming caterpillars, cooked rice mixed with sheep blood is broadcasted. These rice balls attract birds to the paddy field and they pick up these caterpillars thus controlling pest.

### **Control of Leaf Folder**

To prevent leaf folder attack in paddy and ragi, sand is sprayed on the leaves that are wet with fog, so that sand sticks to the leaves. This sand prevents the larva from attacking the crop and feeding on the leaves. The sand also abbreviates the skin of the larvae and causes desiccation and death of the larvae.

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