

Integrated Management of Major Pests of Rice Crop

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Rice (*Oryza sativa*) is one of the most important food crops and feeds nearly 60 % population of India. Although rice protein ranks high in nutritional quality among cereals, protein content is modest, it also provides minerals, vitamins and fiber, although all constituents except carbohydrates are reduced by milling. Therefore, rice being the most consumed cereal grain globally; the growth of rice market is expected to increase. System of intensification is a methodology adopted in various ecosystems and deal with the sustainable best management practices of what farmers have within their available resources which offers the best alternative to increase the productivity of crops with minimum cost. Among the major yield limiting factors pests are said to be an important one. Pest causes 33% production loss in India, the major weed, insect-pests, diseases and other pests causes 12.5, 9.5, 6.5 and 4.5 % respectively. Therefore, to check the yield reduction and quality grain production, the information about identification, damaging symptoms and integrated management of major insect-pests and diseases is given below:

Insect-Pests

Rice Stem Borers: Rice crops are attacked by three species of stem borers, viz. yellow, white and pink stem borer from July to October. Yellow (Photo 1) and white stem borer female moths lay eggs near leaf tips in masses, covered with brown anal hairs, whereas pink stem borer (Photo 2) female moth lays eggs singly inside the leaf sheath like beads. The stem borers' larvae bore into stems and feed there. The affected plants in vegetative stage produce yellow and dry central shoots called, 'dead hearts' (Photo 3). These dead hearts can be easily pulled from the plant, whereas, in older plants, damage symptoms are observed as empty earheads which remain white and stand erect called 'white ears'. Such damaged plants can be easily observed in the field from a distance.

Management: To manage this insect avoid long duration varieties of rice like Pusa 44, Peeli Pusa

and Dogar Pusa. Regular monitoring of crop for stem borers damage is necessary. As and when dead heart damage reaches more than 5 % (economic threshold level (ETL)) in rice, apply any one of the insecticide as given in Table 1. Any of these insecticides may be repeated as and when incidence again reaches at ETL. Apply these insecticides alternately.

Leaf Folder: The adults of this insect is yellow to light brown, fore-wings has distinct dark brown wavy lines and dark brown bands along outer margin. The female moth lays translucent, flat and oval eggs singly or in pairs on the underside of leaf blades. After hatching, young larvae feed on green leaf tissues without folding the leaves, whereas older larvae feed on green tissues by folding them. Damaged leaves produce white streaks and become membranous that reduces photosynthetic activities of the crop.

Management: The incidence of leaf folder may be increase under tree shade, due to more egg laying by the insect. So observe the hot spot area of leaf folder infestation cautiously under tree shade to avoid further damage to the crop. To manage this dislodges the larvae pass 20-30 meter long coir/jute rope, forward and backward, both ways while touching the crop canopy. Care should be taken that water must be standing in the crop and this practice should be done before flowering. Regular monitoring of crop for leaf folder damage is necessary. As and when leaf damage reaches at 10 % (ETL) in crop, apply any of the insecticides (Table 1). Further spray may be given with alternative insecticides as and when leaf damage again reaches at ETH.

Plant Hoppers: Two type of plant hoppers white backed planthopper and brown planthopper attack on rice crop. The females lay eggs in leaf sheath tissues. Both nymphs and adults suck sap particularly from the leaf-sheath from July to October. The symptoms of the damage start appearing from leaf tips and spread to the rest of the plant. The crop

severely attacked by planthoppers ultimately dries up in patches. These dried up patches of the crop are called, '**hopper burn**' (Photo 5). As the plants dry up, the hoppers migrate to the adjoining green plants and within a few days, the area of rusty patches enlarges. These hoppers also excrete honeydew as a result of which sooty mould develops on the leaves, which impart smoky hue to the crop and hinder photosynthetic activities.

Management: The incidence of planthoppers can be reduced by following alternate wetting and drying in routine and drain out the water for 3-4 days depending upon the soil type during infestation. Care should be taken that rice/basmati fields do not develop cracks. Regular monitoring of hopper population is necessary. About one month after transplanting, a few plants in the field should be slightly tilted and tapped 2-3 times at the base at weekly interval and count the number of insects falling on the water. After tapping, if a minimum of 5 hoppers per hill (ETL) are seen floating on the water, only then the crop should be sprayed with any of the recommended insecticides (Table 1). Further application of any of the insecticides may be repeated as and when hopper population again reaches at ETL. For better and effective results, direct the spray towards the base of the plants. If damage is noticed at hopper burn stage, treat the affected spots along with their 3-4 meter periphery immediately as these spots harbour high population of the hoppers.

Rice Hispa: The adult beetles of this pest are shiny bluish-black in colour with numerous short spines over the body. So, it is called as kandian waali bhundii. The female beetles lay eggs within the epidermal layers of leaves, usually on underside of the apical portion of leaves. After hatching the grubs' tunnel into the leaves, whereas, the adults are external feeders. The grub causes damage by producing bold, white streaks on the leaves.

Management: If attack of this insect starts in the nursery, clip-off and destroy the leaf tips at the time of transplanting. If damage noticed in transplanted crop, spray the crop with any of insecticides (Table 1).

Diseases

Sheath Blight (*Rhizoctonia solani*): It is very serious fungal disease of rice crop. The fungal *sclerotia* (a compact mass of hyphae) survive throughout the year in soil and plant debris. Plants are more vulnerable to sheath blight during the rainy season. It occurs in areas where the temperature 28–32°C, relative humidity of crop canopy from 85–100% and use of excessive nitrogen fertilizer. The symptoms of diseases appear on the plants like grayish green lesions with purple margin develop on the leaf-sheath above the water level. Later, the lesions enlarge and coalesce with other lesions. In severe attack of disease resulted that poor filling of the grains.

Management: Destroy the paddy straw and stubbles after harvesting the affected crop. Use of balanced nitrogenous fertilizers dose. Regular survey of the crop is necessary when disease appear in the crop then make the spray of 150 ml Pulsor 24 SC (thiifluzamide) or 26.8 g Epic 75 WG (hexaconazole) or 400 ml Galileo Way 18.76 SC (picoxystrobin + propiconazole) or 200 ml Amistar Top 325 SC or Pikapika 25 EC (propiconazole) or 320 ml Lusture 37.5 SE (flusilazole + carbendazim) in 200 litres of water per acre.

Blast (*Pyricularia grisea*): It is attack on above ground parts of the plants, leaves, nodes and neck. The fungal organisms survive overwinter in the infected seeds and stubbles. The initial symptoms appear on plants like spindle shaped spots with greyish centre and brown margin on the leaves at maximum tillering. It also causes brown lesions on the neck of the panicle, showing neck rot symptoms and the panicles fall over. The disease severely effects on basmati crop particularly in the sub-montaneous regions. The excessive application of nitrogenous fertilizers increases the incidence of disease.

Management: After appearance of disease symptoms spray the crop with 200 ml Amistar Top 325 SC (azoxystrobin + difenoconazole) or 500 g Indofil Z-78, 75 WP (zineb) per acre in 200 litres of water, at the boot and ear-emergence stages.

False smut (*Ustilaginoidea virens*): It is one of the emerging fungal grain disease of rice, wherein the

individual rice grains get transformed into large yellowish/greenish velvety spore-balls (Smut balls). The smut balls are initially yellow in colour and later on its burst and the colour changes to orange, yellowish green, green, olive green and finally greenish black. Only few grains in a panicle are usually infected and rest of grains become normal. Favorable weather like high relative humidity, rainy and cloudy days during the flowering period increase the incidence of the disease. The application of organic manures and high dose of nitrogenous fertilizers also increases the intensity of attack.

Management: To manage this disease, spray the fungicides 400 ml Galileo Way 18.76 SC (picoxystrobin + propiconazole) or 500 g Kocide 46 DF (copper hydroxide) in 200 litres of water per acre at boot stage of the crop in disease prone areas.

Brown spot of rice (*Drechslera oryzae*): This is well known fungal disease of rice caused by *Helminthosporium oryzae* (Syn. *Bipolaris oryzae*, *Drechslera oryzae*). The disease appears from seedling to milking stage. The symptoms of the disease start on leaves as oval, eye-shaped spots with a conspicuous dark-brown dot in the centre and light brown margin. Spots are also produced on the grains. The relative humidity (86–100%) and temperature between 16 and 36°C are the favorable weather of disease development. It disease commonly appear in nutrient-deficient soil, or in soils that accumulate toxic substances.

Management: Apply fertilizers on soil testing or leaf colour chart base. Spray the crop with 80 g Nativio 75 WG (trifloxystrobin + tebuconazole) in 200 litres of water/ac at disease initiation. First spray at boot stage of crop and repeat the second spray 15 days interval.

Bunt/Kernel Smut (*Neovossia horrida*): Due to this disease the only few grains are infected in the panicle. Frequently, only a part of the grain is replaced by a black powder. Sometimes, entire grain is also attacked and the black powder scatters on to other grains or leaves, and this is often the easiest way to detect the disease in the field. Avoid heavy doses of nitrogenous fertilizers.

Note: To spray insecticides by using 100 litres of water per acre with Knapsack sprayer having fixed type hollow cone nozzle

Conclusion

Insect-pests and diseases of rice crop can be successfully managed by integrating different control methods. This will be more helpful to the rice growers and shelling industry for getting higher economic returns. Farmers should remain vigilant right from the transplanting the crop till harvesting. All the affected plant parts along with eggs/insect larvae/disease spores/infected plant parts should be removed and destroyed. There are many species of natural enemies in rice ecosystem (spiders, coccinellids, dragon fly, damsel fly and *Trichogramma*) those are very effective in against insect-pests. So, the farmers are suggested to apply need based insecticides and fungicide only.

Caution

- Do not give early season blanket application of pesticides, particularly synthetic pyrethroids as they result in an increase in the population of harmful insect-pests and **kill the natural enemies and do not repeat the same pesticide** after its first spray.
- Apply only recommended dose of insecticides/fungicides and these should not be increased or decreased.

Table 1. Recommended insecticides against insect-pests

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Insect/ Crop	Insecticide	Brand(s)	Dose/ac	Method of application
Stem borers	chlorantraniliprole*	Coragen 18.5 SC	60 ml	Spray
	flubendiamide 39.35%*	Fame 480 SC	20 ml	
	flubendiamide 20%*	Takumi 20WG	50 g	
	cartap hydrochloride	Mortar 75 SG	170 g	
	chlorpyrifos	Coroban/Dursban/Lethal/Chlorguard/ Durmet/Classic/ Force 20 EC	1 litre	
	azadirachtin 5%	Ecotin	80 ml	
Leaf folder	chlorantraniliprole*	Coragen 18.5 SC	60 ml	Spray
	flubendiamide 39.35%*	Fame 480 SC	20 ml	
	flubendiamide 20%*	Takumi 20WG	50 g	
	cartap hydrochloride	Mortar 75 SG	170 g	
	chlorpyrifos	Coroban/Durmet/Force 20 EC	1 litre	
	azadirachtin 5%	Ecotin	80 ml	
Plant hoppers	triflumezopyrim	Pexalon 10 SC	94 ml	Spray
	dinotefuran	Osheen/ Token 20 SG	80 g	
	pymetrozine	Chess 50 WG	120 g	
	Quinalphos	Ekalux/Quinguard/Quinalmass 25EC	800 ml	
	azadirachtin 5%	Ecotin	80 ml	
	PAU Homemade Neem Extract	PAU Homemade Neem Extract	4 litre	
Rice hispa	quinalphos	Ekalux 25 EC	800 ml	Spray
	chlorpyrifos	Dursban 20 EC	1 litre	

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