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Management of Insect Pests in Rice Crop

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India is among the leading producers of rice and contributes significantly towards food security of millions of people in the world. However, insect pests cause a considerable loss of crop yield by damaging various parts of the rice plant, starting from leaves to roots and developing grains. Rice crops tend to suffer the most damage from yellow stem borers, leaf folders, brown planthoppers, white-backed planthoppers, gall midges, rice hispas, rice caseworms, and rice bugs. One of the downsides of using chemical insecticides is the elimination of the predators and other beneficial organisms from the area along with the increase in the cost of production. Thus, IPM is an important method for sustainable cultivation of rice. IPM is a combination of the use of resistant varieties, proper establishment of crops, proper nutrient management, field sanitation, pest monitoring, Protection of natural enemies, biological control, and judicious use of agricultural chemicals. Timely field monitoring of pest incidence and proper pest identification are very important for timely management. ICAR-IIRR has developed participatory IPM methods, and digital tools for the implementation of IPM.

Keywords: Rice, pest, Integrated Pest Management, Stem Borer, Brown Planthopper, Leaf Folder, Biological Control Introduction

Introduction

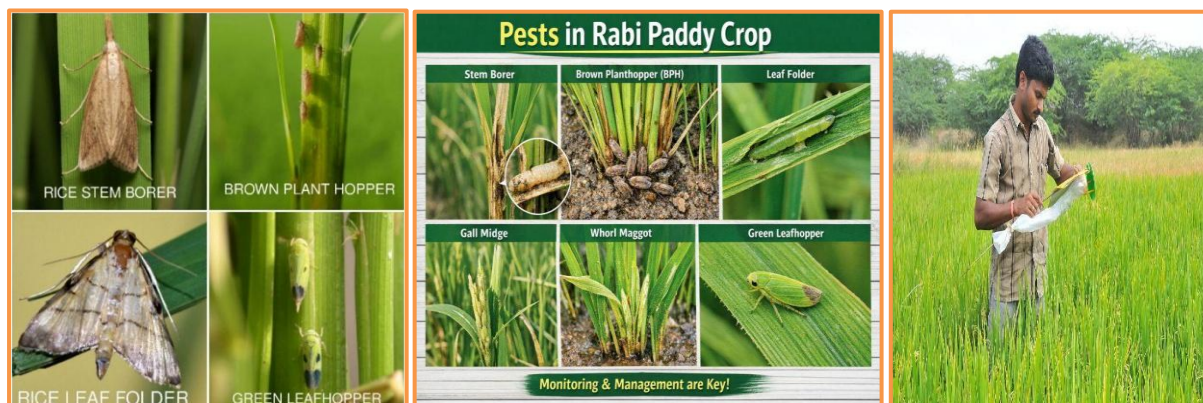
Pest insects will be affecting rice crops at different times of the season. Such bugs come and go due to several variables like species of rice being cultivated, how rice was cultivated, climatic conditions, use of fertilizer and irrigation system, and other plants growing around it. As per ICAR-IIRR, stem borer, planthopper, gall midge, and leaf folder are some of the key insects impacting the rice crop under rice insects. The purpose of pest control is certainly not to kill every insect in the field, as there are insects like predators and parasitoids, which can provide natural control of many insects. In fact, the goal should be to maintain the pest insect population at a level in economic terms, without negatively affecting other beneficial organisms, and reducing pesticides in the agricultural operations. This is the basic principle of IPM.

Major Insect Pests of Rice

Yellow Stem Borer

The yellow stem borer is one of the important pests of rice. Larvae enter the stem and feed internally. During the vegetative stage, infestation produces **dead hearts**, while infestation during the reproductive stage can result in **white ears**.

Regular field scouting is important. The identification and destruction of eggs masses should be carried out wherever possible, and the affected dead hearts may be removed. ICAR recommends monitoring of stem borer activity and using of pheromone traps as part of the integrated management programme.



Major insect pests of rice and their management through an integrated pest-management approach

Rice Leaf Folder

The leaf-folder caterpillars are known for folding rice to feed on its green tissues. Such larval infestation can severely reduce the capacity of the crops for photosynthesis meaning that monitoring of this pest infestation is necessary. The cultivation technique requires that the crops be monitored so that the preferred time for insect development is determined. Chemical control, where necessary, should be based on local recommendations and pest intensity rather than routine spraying.

Brown Planthopper

The Brown Planthopper is a significant threat to rice crops because sap gets sucked out of rice plants from the nymphs as well as the adults. Severe infestations can lead to a condition called hopper burn in which the affected area becomes brown and dry.

Some contributing factors to the presence of the planthopper include the presence of excess nitrogen in the soil, standing water and indiscriminate use of insecticides. Effective methods for controlling the planthopper include the balanced application of fertilizers, correct water management and protection of natural enemies of the planthopper.

Gall Midge

Gall midge infestations follow rice seedlings and result in unique silver shoots or gall-like formations. They are dangerous pests in vulnerable varieties under favorable conditions. Growing resistant or tolerant varieties and adopting locally recommended planting practices are important components of management.

Rice Hispa and Other Defoliators

Rice hispa adults and larvae damage leaf surfaces, producing scraping and mining symptoms. Other occasional pests such as caseworm, grasshoppers and rice bugs may also occur depending on the locality and season.

Correct identification is essential before selecting a management measure. ICAR-IIRR's Rice Clinic provides information on major rice pests, their symptoms and recommended management practices.

Table 1: Major Insect Pests and Management Approaches

Insect-pest	Major symptom/damage	Important management approaches
Yellow stem borer	Dead hearts, white ears	Monitoring, egg-mass destruction, pheromone traps, resistant varieties
Leaf folder	Folded and scraped leaves	Field monitoring, balanced nutrition, natural enemies, need-based control

Insect-pest	Major symptom/damage	Important management approaches
Brown planthopper	Hopper burn	Balanced N, water management, conserve predators, need-based control
Gall midge	Silver shoots/onion-like galls	Resistant varieties, sanitation and locally recommended practices
Rice Hispa	Scraping/mining of leaves	Monitoring, field sanitation and need-based intervention
Rice bug	Grain damage	Monitoring and timely management where economically justified

Managing Insects in Rice Growing Preventive pest management programs must begin before any infestation occurs. Key elements include:

Use of Resistant Varieties

Host-plant resistance is one of the most economical and environmentally friendly approaches. ICAR-IIRR has maintained screening programmes for resistance against major rice insect pests and considers host-plant resistance an important component of rice IPM.

Crop and Field Management

Spiders and ladybird beetles are some of the predators that may help control the population of rice pests. However, incorrect application of insecticides may cause harm to these valuable creatures.

Monitoring and Economic Thresholds

Farmers should regularly inspect the crop for insect numbers and damage symptoms. Management should be initiated when pest populations reach locally recommended **economic threshold levels (ETLs)** rather than applying insecticides automatically.

Protection of natural enemies

Natural Enemies of rice pests like spiders, ladybird beetles, predacious bugs, and parasitoids act as insect regulators. Insect pest management includes. The use of broad-spectrum insecticides can lead to the loss of these organisms giving rise to pests.

ICAR-IIRR has investigated ecological engineering approaches designed to enhance natural enemies and manage planthoppers.

Biological and Behavioural Methods

Biological control agents, pheromone traps, light traps and habitat-management approaches can form part of an integrated strategy. ICAR-IIRR has also developed a trap-crop approach using aromatic rice for yellow stem-borer management in suitable endemic areas.

Need-Based Chemical Control

Insecticides should be considered only when monitoring indicates that intervention is necessary. The product, dose, waiting period and application method should follow the current recommendation of the state agricultural university, ICAR or agriculture department and the registered label. The use of the same group of insecticides repeatedly should be avoided as that would result in faster resistance development.

Conceptual Approach

Paddy Field → Surveillance Monitoring → Accurate Pest Identification → Pest Population Analysis → Comparison with ETL → Selection of IPM Method → Use of Agricultural/ Natural/ Mechanical Techniques → Application of Chemicals Whenever Necessary → Review.

This process allows for the application of pesticides less frequently and provides better pest control through sustainable practices.

Role of Digital Agriculture

Digital tools are becoming useful in rice pest management. Mobile applications can help farmers identify pests from symptoms and obtain management information. ICAR-IIRR's **Rice Clinic** provides information on 11 major rice pests, including identification features, damage symptoms and management recommendations.

In the future, robots recently being developed in the form of mobile imaging systems and remote-sensing technologies, traps and artificial intelligence (AI) will allow pest early detection and decision-making to be developed.

Conclusion

Control of insect pests is an essential factor in achieving good yield and profit for rice. Important pests, such as yellow stem borer, leaf folder, brown planthopper, white-backed planthopper and gall midge should be regularly observed and controlled. Steping to **Integrated Pest Management** is the best technique, which includes resistant varieties, good agricultural practices, continuous monitoring in the **field, preservation of natural enemies, biological methods** and **insecticide application according to the situation**. The indiscriminate use of pesticides is to be avoided, because it may negatively affect beneficial organisms and promote the development of resistance. In summary, pest management in rice should be directed, not at eliminating insects, but at keeping pests at levels which are not harmful for rice cultivation and the ecosystem.

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