AgroScience Today

Popular Article

e-ISSN: 2583-0147

Volume 5 Issue 7
Page: 0918 - 0920

From Chemical Dependence to Integrated Pest Management - A Path Forward for Paddy Cultivation

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Published on: July 31, 2024

ABSTRACT

Pests and diseases cause significant crop losses every year, despite the fact that rice (*Oryza sativa*) is the staple food for more than half of the world's population. Paddy farmers use various pesticides to combat these issues, but their indiscriminate use has led to environmental and health problems, including insecticide resistance, pest resurgence, ecological imbalances and negative impacts on beneficial organisms and biodiversity. In India, heavy reliance on pesticides can make paddy farming uneconomical when pest control fails. In spite of the introduction of integrated pest management, chemical control is still the predominant method used by paddy farmers to manage pests. This trend has escalated significantly, leading to pesticide resurgence and resistance in insect pests such as leafhoppers brown plant hoppers, and rice leaf folder. Additionally, there is a risk of pesticide residues in grains. Therefore, it is crucial to encourage the use of less toxic chemicals, biopesticides, and practicable cultural methods while maintaining crop yields. This shift requires governmental support and the effective dissemination of scientific knowledge to farmers.

INTRODUCTION

Rice (*Oryza sativa*) is a primary food sources for more than half of the world's population. But each year, pests and diseases cause significant yield losses (Hu et al., 2014). To tackle the pest and disease problem in paddy fields, farmers are using a wide variety of pesticides. As a result of novel chemicals being launched in response to changing insect scenarios, environmental demands, and food safety standards, these pesticides have been crucial in ensuring food security over time. In agriculture, applying pesticides to crops is a common technique to safeguard them against diseases, insect pests, and weeds that could threaten food production and farmers' livelihoods. The regular and injudicious use of broad-spectrum synthetic pesticides can contaminate water, air, and soil, causing a negative effect on the environment (Pathak et al., 2022). Consequently, it has led to many undesirable problems, such as the development of insecticide resistance in insects, disruptions to the natural balance of life due to the weakness of biotic factors, outbreak of secondary pests, residues in the agro-ecosystem, pest resurgence, and effects on beneficial organisms such as earthworms, bees, parasites, predators and spiders, accumulation of pesticides in the food chain, health problems such as poisoning of domestic animals and humans; harm to wildlife; and loss of biodiversity (Tudi et al., 2021). The kinds of chemicals used, how often and how much of them are applied, and how long they last all affect the frequency and intensity of each of these effects. As a result, pests have challenged farmers, particularly paddy growers.

In India, paddy cannot be grown profitably without plant protection measures against pests. Their whole reliance on pesticides can be justified if pest control is successful since it produces high yields and profitable outcomes, even though it is not ideal for a sustainable program. However, paddy growth may become unprofitable due to the extra treatment required to reestablish control when control becomes week. Since the paddy cultivation was accepted as the most profitable in the wake of the release of high-yielding varieties and hybrids, pest control has undergone drastic changes. Excessive use of chemical pesticides was considered a necessity for maximizing yield. As a result, not only did the spectrum of pesticides change with the introduction of new molecules, but also the total quantum of toxicants, as the dosage per spray and number of sprays increased exponentially. Thus, increased pesticide pressure uninterruptedly caused leaps and bounces. Due to the unscientific use of pesticides, many sucking pests' viz., leaf hoppers and brown plant hopper of paddy have developed resurgence where the pest population in treated areas abnormally increases compared to untreated fields, in spite of a good initial kill.

Insecticides are also being used commonly used towards the flag end of crop growth for managing certain pests, including stemborer, and paddy gundhi bug. Hence, there is a possibility of pesticide residue remaining in the grains, and the use of insecticides has become an unavoidable evil.

Keeping all these points in view, it is necessary to find nonchemical means of pest management and integrated pest management of paddy pests so that the problem of the 3 R's, namely resistance, resurgence, and residues, can be minimized. Adoption of integrated pest management tactics incorporating an array of biological, physical, and chemical ways to control

pests has been implemented with varying degrees of success to encourage safer use of pesticides in the paddy field. The farmers may be encouraged to use not only less toxic chemicals for humans and livestock but also less persistent chemicals in the environment instead of more toxic and persistent chemicals. Consequently, it is unacceptable to use highly hazardous pesticides or apply chemical pesticides that put agricultural workers in danger. In order to help farmers transition to ecologically friendly, sustainable, and health-conscious farming practices, government organizations must to recognize these options and offer them proactive assistance. Thus, while maintaining nearly the same level of crop output, the usage of traditional (chemical) pesticides can be significantly reduced when biopesticides are incorporated into integrated pest management (IPM) programs. (Pratap and Sharma 2004). However, using biopesticides effectively necessitates a deep grasp of pest management, particularly for end users.

CONCLUSION

This study examined the factors influencing paddy farmers' intentions to use pesticides. Controlling pesticide contamination and its detrimental effects on non-target animals, human health, and the environment requires swift action. Implementing appropriate policy initiatives is crucial to ensure the proper application of pesticides in rice fields. This includes disseminating scientific knowledge on pesticide usage and integrated pest management strategies. Such measures will reduce health hazards and help produce pesticide residue-free crops.

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