Journal of Experimental Agriculture International

Volume 46, Issue 7, Page 875-880, 2024; Article no.JEAI.119518
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Assay of Front-Line Demonstration on Integrated Pest and Disease Management (IPDM) in Rice in the Vikarabad District of Telangana, India

C. Yamuna [a++*], N. Praveen [b#], T. Laxman [a++], T. Rajeshwar Reddy [c++] and C. Sudha Rani [c†]

[a] District Agricultural Advisory and Transfer of Technology Centre, Tandur, Prof Jayashankar Telangana State Agricultural University, 501141, India.
[b] Extension Education Institute, Hyderabad, Prof. Jayashankar Telangana State Agricultural University, 500030, India.
[c] Agricultural Research Station, Tandur, Prof. Jayashankar Telangana State Agricultural University, 501141, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i72641

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/119518

Original Research Article

Received: 24/04/2024
Accepted: 28/06/2024
Published: 02/07/2024

[++] Scientist;
[#] Principal Scientist;
[†] Principal Scientist and Head;
**Corresponding author: E-mail: yamunareddy.chintalakunta@gmail.com;*

Cite as: *Yamuna, C., N. Praveen, T. Laxman, T. Rajeshwar Reddy, and C. Sudha Rani. 2024. "Assay of Front-Line Demonstration on Integrated Pest and Disease Management (IPDM) in Rice in the Vikarabad District of Telangana, India". Journal of Experimental Agriculture International 46 (7):875-80. https://doi.org/10.9734/jeai/2024/v46i72641.*

ABSTRACT

Rice crop is attacked by various insects and diseases in spite of using pesticides, but relaying only on synthetic pesticides usage resulted into disrupt the natural balance between crop pests and their existed natural enemies. Integrated pest and disease management (IDPM) is a concept which is blended with all possible proven technologies like Cultural, Mechanical, Biological and Chemical methods. Front line demonstration on Integrated Pest and Disease Management in rice was taken up in farmers fields during kharif season of two consecutive years of 2021 and 2022 by DAATTC, Tandur in Vikarabad district of Telangana. Study revealed that seed treatment with Carbendazim @3gm/kg seed, seedling root dip with Pseudomonas species 10gm /lit of water, application of Carbofuran granules @160g/cent nursery, installation of pheromone traps, formation of alley ways and need based application of fertilizers and pesticides reduced the pest like Stem borer, BPH, Leaf folder and Blast disease significantly compared to farmers practice. Mean higher yield was recorded in demo field 6065 kg/ha compared to 5795 kg/ha in check, and showed 4.6 per cent yield increases in demonstration fields.

Keywords: Rice disease management; grain crops; pest species.

1. INTRODUCTION

Rice is the main grain crops and staple foods in India in worldwide approximately 114 countries are growing Rice, most of them in Asia and Africa (Liu et al., 2014). Year after year rice cultivation increasing which also increase number of pests which led over-optimal application of insecticide and herbicides [1-4]. In the year 1950 found that indiscriminate use of pesticides raised pesticide resistance to insects under harsh environment, its lead the development of IPM (Jammal Hajjar et al). IPM is a pest management system that utilize all the feasible techniques and methods in a compatible manner as possible and maintains the pest population at levels below those causing economically unacceptable damage or loss. (Shah Fahad et al).

Rice (*Oryza sativa)* is the most commonly cultivated in the world, from seed through harvest rice plant is susceptible to a variety of insects. Integrated pest management (IPM) is an adaptation to the life cycle of the insect and its behaviour, for developing a successful IPM plan, it is essential to know the farmer's agricultural practices and knowledge of pest species in a given agro-ecosystem, a farmers practices and a well-designed IPM plan should be closely linked in rice ecosystems.

2. MATERIALS AND METHODS

Lack of knowledge on IPM technology, improved high yielding varieties, prolonged dry spells and high moisture levels that encourage the prevalence of pest and diseases in traditional farming methods [5]. Front-line demonstration is the new concept of field demonstration evolved by the Indian Council of Agricultural Research in this field demonstrations are conducted under the close supervision of scientists. The main objective of Front-line demonstrations is to demonstrate newly released crop production and protection technologies and its management practices in the farmers field under different agro-climatic regions and farming situations. Demonstration on integrated pest and disease management in rice grounded by the District Agricultural Advisory and Transfer of Technology Centre (DAATTC) located at Tandur, Vikarabad district in Telangana. The present study was taken up in the years 2021 and 2022 during kharif seasons, conducted in 10 farmers fields in different villages. Rice is the major crop in the Vikarabad district area under rice crop during kharif season 133586 acres in the year 2021 and 111629 acres in the year 2022 respectively.

Farming situation under study was black soils are medium fertile with irrigated conditions. Each demonstration was conducted in an area of 0.4 ha and adjacent to the farmer's fields in which the crop was cultivated with farmer's practice. The demonstration on Integrated Pest and Disease Management of rice comprised cultural, mechanical, and chemical interventions as mentioned in Table 1. Before the commencement of the FLD trail in farmers field conducted a baseline survey and identified constrains in the rice productions. Initially created some awareness among the farmers on the technology through sensitization programs, method demonstrations, farmer -Scientist interactions. The FLD was led to concentrate on the potential yield decrease factors that are fundamentally

Table 1. The details of the IPDM interventions and farmers practices

Demonstration	Farmers Practice
Seed treatment with Carbendazim @3g / kg seed	Not followed
Seedling root dip with pseudomonas 10gm/lit water	Not followed
Clipping of leaf tips before transplanting	Not followed
Need based application of Nitrogen and Potash fertilizers	Excess use of Nitrogen fertilizers and no/low usage of Potash f ertilizers
Removal of alternate and collateral host of pest	No proper weed management
Formation of alleyways of 20 cm for 2m	Close planting of rice
Erection of Pheromone traps @ 4/acre	Not installed
Passing a rope against leaf folder and caseworm	Not followed
Spray Azadiractin 1500 ppm	No usage of neem based products
Need based Chemical spray • Application of Chlorantraniliprole 4G granules 400 gm/ 2.5 cent nursery before 7 days transplanting at nursery stage and Spraying of Chlorantraniliprole • Pymetrozine 50 %WG @ 0.6g or Dinotefuran 20% SG @ 0.4 g/lit against BPH • Trifloxystrobin + Tebuconazole @0.4g / Tricyclazole + Mancozeb @ 2.5g/lit , Spraying of Propiconazole 25% EC @ 1.0 ml/lit against Blast/Neck blast/ False smut	Indiscriminate and over dose use of pesticides

because of the pests and diseases during different crop growth stages and yield difference between the farmers practice and demonstration. Collected the yield data by random crop cutting method from both the demonstration and farmers practice and used statistical tools for data analysis. Data parameters like percent increase in yield, cost of cultivation, gross returns, net returns, and benefit cost ratio were recorded. In this study pest like Stem borer, BPH, Leaf folder and blast disease were observed in farmers practice as well as demonstration fields with different levels of intensity. Percent incidence of stem borer recorded during vegetative stage based on dead heart counting among the total tillers in a hill. Similarly, white ears count and panicle bearing tillers were recorded near maturity of crop. Observations on the BPH incidence was assessed by periodic scouting and hopper burn symptoms, counting no. of adults of BPH population/hills (Narender G et al) from randomly selected 100 plants by the counting of total number of larva/hill, and the total number of damaged leaves/hill only if one third of leaf area is damaged by rice leaf folder (Kavad N K et al). Blast disease incidence was recorded during different stages of crop growth by observing spindle shape lesions on leaves as well as chaffy grains count by using the following 0-9 scoring scale as described by IRRI (2002) and Ghazanfar et al*.,* (2009).

Leaf damage (%) = Total number of damaged leaves / Total number of leaves (Healthy + Damaged) × 100

PDI = Sum of the scores / Number of observations × highest number in rating scale * 100

Present increase in yield = yield in demonstration - yield in farmer's practice yield in farmer's * 100 practice

3. RESULTS AND DISCUSSION

The results of pest and disease percent damage present in Table 2. In demonstration fields stem borer incidence reduced up to 40.3% compared to farmer practices (Table 3). The results revealed with the interventions implemented in the demonstrated plot like Clipping of leaf tips of seedlings during transplanting removes egg masses of stem borer from nursery to main field. Application of Carbofuran granules @ 160 gm/cent nursery at one week before transplanting and 25 kg/ha at 15 DAT in main field and Installation of pheromone traps 10/ha for the monitoring of stem borer and need based pesticide applications lower the incidence of stem borer 18.5% in demonstration plots compared to the farmers practices *i.e* 31%. Similar results were observed by Shankar et al [6] and Ramulamma et al [7] that observed higher yields and net returns in demonstration fields compared to farmer practice.

Table 2. Percent pest and disease incidence observations in demo and check

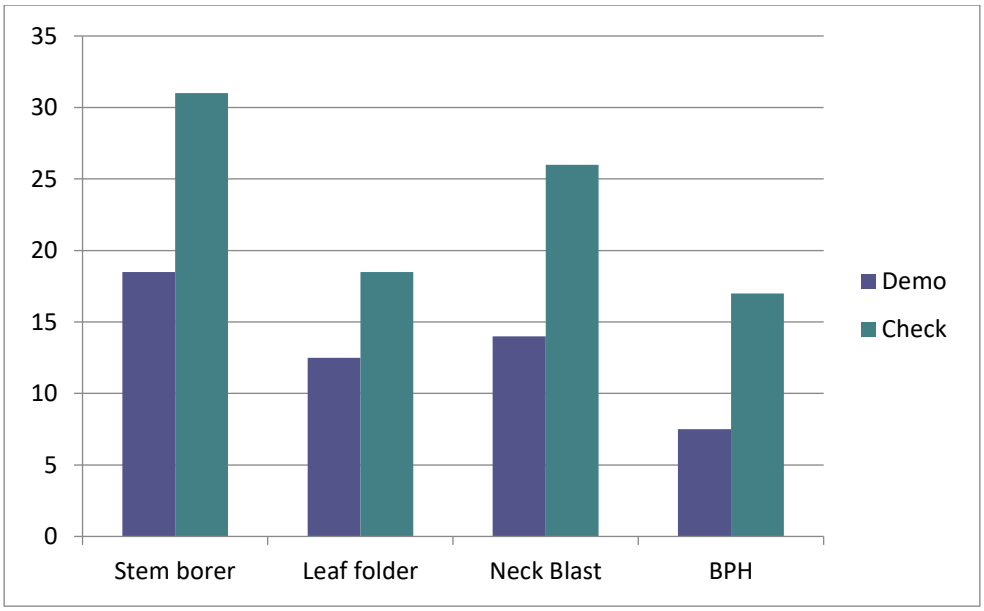
Year	Per Cent Pest and Disease Incidence							
	Stem Borer		Leaf Folder		Neck Blast		BPH	
	Demo	Check	Demo	Check	Demo	Check	Demo	Check
2022	25	34	12	19	16	30	6	10
2023	16	28	13	18	12	22	9	24
Pooled	18.5	31.0	12.5	18.5	14	26	7.5	17

Table 3. Percent reduction of pest in demo over check

Percent Reduction of Pest in Demo Over Check	
Stem borer	40.3
Leaf folder	32.4
Neck Blast	46
BPH	55

Table 4. Yield returns and C:B Ratio

Year	Yield (Kg/Ha)		Cost of Cultivation		Net Returns/ha		C:B Ratio		% Increase
	Demo	Check	Demo	Check	Demo	Check	Demo	Check	
2023	6186	5808	65000	70,000	62,431	49,644	1:1.9	1:1.7	6.5 %
2022	5944	5783	50100	61560	66,402	51,728	1: 2.32	1: 1.84	2.6%
Pooled	6065	5795	57550	65780	64416	50686	1:2.11	1:1.77	4.6



Graph 1. Representation of Per cent reduction of pest in demo over check

The incidence of BPH in farmers practice recorded as 17% whereas as in demonstrated plot recorded 7.5% with 55% pest reduction in demonstrated fields by the interventions viz: formation of alley ways, recommended dose of nitrogenous fertilizers, alternate wetting and drying. Spraying of Azardiractin 1500 @ 5ml/lit during initial stages of BPH infestation and Buprofezin @ 1.6 ml/lit for adult management significantly reduces pest population. Observed effective management of BPH in demonstration fields implemented with IPM practices with Narender et al (2022). When it comes to leaf folder 32.4 % pest damage reduced and percent damaged leaves indicates the 12.5% pest infestation in demo which is lower when

compared to farmers practice 18.5%. Rope pulling was the impactful techniques prior to the spraying of Azadiractin 1500 ppm.

Blast is one of the most economically significant disease of rice. The pathogen attacks the crop at all the growth stages and causes huge grain yield losses in the field Yashaswini et al [8] The disease severity level was estimated by evaluating the percentage of the relevant host tissue or organ covered by symptoms (or lesions) of the disease also the number and size of the lesions Nandita Mandal et al (2023). In this study, the extent of disease severity was evaluated based on the protocols given by the IRRI (International Rice Research Institute) (1996). The Per cent incidence of blast disease recorded in demo field is 14% where as in farmers practice 26% which indicates that 46% disease reduction observed. Excessive usage of nitrogen fertilizers by the farmers has been found to affect severity of the disease to a great extent Kapoor and Sood, [9]. Seed treatment with Carbendazim 3gm/kg, need based fertilizer application and removal weed host reduces the disease incidence (Amtmann et al*.,* 2008 & Veresoglou et al*.,* 2014). Application of nitrogen in splits doses reduces excessive vegetative growth during early season and reduces severity of blast diseases [10-12].

Grain Yield and Economics: the data presented in Table 4. Revealed yield differences between demonstration and farmer's practice [13-15]. The Per cent increase in yield in demonstration over farmers practice ranged is 6.5 Per cent with highest being recorded during kharif, 2022. The data clearly revealed that, the net returns from the demonstration is substantially higher than farmers practice. The average net returns from the demonstration is Rs 64416/ha as compared to Rs 50686/ha in farmers' practice. The cumulative effect of demonstration over two years, recorded an average benefit cost ratio 2.11 percent that is higher than farmers practice 1.77 [16-18].

4. CONCLUSION

The results of the present study indicated that, adoption of Integrated Pest and Disease Management practices significantly reduced the pest population in rice fields and considerably increased the presence of natural enemies in the eco system. The farmers satisfied with the IDPM technologies in rice which increased the yield, reduced the requirement of chemical pesticides and fungicides with better control of pest and diseases.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Reddy, Ankireddy Jawahar, Chethan T, Sudarshana Bhujel, Vijay R, Nandini SN, Ayesha Siddiqua, Arshad Khayum. Maximizing yield and sustainability: a comprehensive approach to integrated pest management in horticulture crops. Journal of Advances in Biology & Biotechnology. 2024;27(5):632-49. Available:https://doi.org/10.9734/jabb/2024/v27i5824
2. Ajaharuddin, SK MD, Madan Lal, Ashwani Yadav, Nitin Kumar, Atul Dhakad, Gayatri Sinha, Budhesh Pratap Singh, Archana Upadhyay. Breeding for resistance against pest and diseases in tomatoes: a review. Journal of Scientific Research and Reports. 2024;30(6):469-79. Available:https://doi.org/10.9734/jsrr/2024/v30i62063
3. Ciancio A, Mukerji KG, editors. General concepts in integrated pest and disease management. New York, NY, USA:: Springer; 2007.
4. Gullino ML, Albajes R, Nicot PC, editors. Integrated pest and disease management in greenhouse crops. New York, NY, USA:: Springer International Publishing; 2020
5. Samant TK. Evaluation of front line demonstration on drought tolerant rice (*Oryza sativa* L.) variety satyabhama in Mid Central Table land Zone of Odisha. International Journal of Bio-resource and Stress Management. 2017;8(6):871-876.
6. Shankar M, Ravinder Naik V, Balazzii Naaiik RVT. Assessment Of Ipm Practices Against Yellow Stem Borer *Scirphophaga Incertulas* (Walker). Indian Journal of Entomology. 2024;86(1):246-249.

7. Ramulamma A, Chaitanya T, Kishore Kumar N, Rambabu E, Malathi S. Front line demonstration of ipm approaches against yellow stem borer in rabi rice in Telangana. Biological Forum – An International Journal. 2022;14(2):414-418.
8. Yashaswini CH, B. Pushpavati M. Seshu M. Morphological and molecular variability among rice blast pathogen (*Magnaporthe oryzae*) Isolates in Southern India. Environment & Ecology. 2017;35(4B): 3015-3022.
9. Kapoor AS, Sood GK. Effect of time of application and splitting of nitrogen on rice blast. Indian Phytopathology Environment and Ecology. 2017;53(3):3015-3022.
10. Johnston E, Paul RP, Coleman K. Soil Organic Matter: Its Importance in Sustainable Agriculture and Carbon Dioxide Fluxes; 2017.
11. Advances in Agronomy. 2009:1-57.
12. Annantmann. The Effect of Potassium Nutrition on Pest and Disease Resistance in Plants; 2008.
13. Gupta AK. Seasonal Incidence of Rice Leaf Folder *Cnaphalocrosis Medinalis* (Guen.) In Agro Climatic Condition of At Baster Plateau Zone. Annals of Plant and Soil Research. 2015;17(1):24-28.
14. Nandita M, Sujan A , Das Dk, Sahoo Rn, Kumar A , Viswanathan C , J. Mukherjee J , Rajashekara H, Shalini G. Assessment of rice blast disease using hyper spectral vegetation indices. Journal of Agricultural Physics. 2022;22(1):89-98.
15. Narendar G, Madhushekar BR, Avil Kumar K, Goverdhan M. Management of brown plant hopper *Nilaparvata lugens (*Brown plant hopper) in rice in Nalgonda and Yadadri Bhuvanagiri districts of Telangana. The Pharma Innovation Journal. 2022; 11(6):1587-1591.
16. Shankar M, Meera SN, Arunkumar S, Balazzii Naaik RVT, Sumalini K, Ravindernaik V. Assessment of frontline demonstration on rice production in Telangana. Indian Journal of Agricultural Research. 2023;4:5-6.
17. Usman GM, Habib A, Sahi ST. Screening of rice germplasm against *Pyricularia Oryzae* the cause of rice blast disease. Pakistan Journal of Phytopathology. 2009; 21(1):41-44.
18. Vereseglou SD, Barto EK, Menexes G, Rillig MC. Fertilization affects severity of disease caused by fungal plant pathogens. Plant Pathology. 2024;62(5): 961-969.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/119518