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RESEARCH ARTICLE :

Evaluation and adoption of IPM modules in rice in Krishna district of Andhra Pradesh

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SUMMARY : India is the second largest producer and consumer of rice grown in the world after China. Pest and disease intensity is increasing slowly due to many factors. The control of leaf folder and stem borer, many methods has been adopted but insecticides are still playing a key role for its control. Integrated Pest Management (IPM) is one of the ecofriendly approach which can be utilized to control the non-judicial uses of insecticides to control rice insect pest. Krishi Vigyan Kendra, Ghantasala conducted frontline demonstrations to demonstrate the efficacy of rice IPM technology on farmers' field under real farming situation during *Kharif* 2014 to 2016. Altogether totally 45 demonstrations were laid out over an area of 12 hectares. Increased yield ranged from 28.50 to 35.25 q/ha with average yield of 31.90 q/ha was observed in IPM module and also recorded highest grain yield of rice 35.25 q/ha in IPM module compared to non- IPM module. It has been observed that among IPM trained farmers, various cultural practices have wide spread adoption as against very low adoption of biological practices. Because of poor knowledge about pest-specific lures, its use and non - availability lead to poor adoption of the mechanical practices. The major problems reported in biological practices and its adoption were its slow action against the target pest, lack of easy availability, short shelf-life and low survival of these bio-agents on farmers' field. Therefore, more awareness programmes and more demonstrations should be demonstrated on IPM module which is eco-friendly and safer to non-targeted organism in comparison to conventional insecticides.

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BACKGROUND AND OBJECTIVES

For decades rice crops have directly or indirectly played a key role in the livelihood of several billion people. Rice is the most important grain with regard to human nutrition and caloric intake, providing more than one-fifth of the calories consumed worldwide by humans. Rice is one of the chief grains of India. India is the second largest producer and consumer of rice grown in the world after china. Green revolution which leveraged agricultural research and technology to increase agricultural productivity in the developing world and there has a constant increase in the number of insect and non-insect pests and also a concomitant shift in their pest intensity, diversity, and spread in rice. Insect pests and disease infestations are the primary constraints in rice (*Oryza sativa*) production systems. Pest and disease intensity is increasing slowly due to many factors. The major factors are extensive cultivation of high yielding varieties, growing of susceptible varieties, intensified rice cultivation throughout the year providing constant niches for pest multiplication, indiscriminate use of fertilizers, particularly application of high levels of nitrogen, non-judicious use of insecticides resulting in pest resistance to insecticides, and resurgence of pests and out breaks of minor pests. Pest are also limiting rice productivity in rice growing areas of Krishna district in Andhra Pradesh. Stem borer infestation at vegetative stage of crop produces dead heart symptoms while infestation at reproductive stage produces white ear. The rice leaf folder earlier considered as a minor pest has gained the status of major pest with widespread in high yielding rice varieties and hybrids. The control of leaf folder and stem borer, many methods has been adopted but insecticides are still playing a key role for its control. Non-judicial and repeated application of insecticides at improper doses may causes several problems such as disrupting natural enemy complexes, secondary pest outbreak, pest resurgence, development of insecticide resistance and environmental pollution. There is an urgent need to find viable alternatives to pesticides so as to minimize the pesticide residues. According to the noted agricultural scientist, Swaminathan (1999), agriculture production systems in the 21st century need to be based on the appropriate use of biotechnology, information technology and eco-technology. Integrated Pest Management (IPM) is one such technology.

There is an urgent need to develop an alternate method/technology which can effectively control the insect pests population below economic threshold level and also enhance the rice production without harming the ecological niche. Integrated Pest Management (IPM) is one of the ecofriendly approach which can be utilized to control the non-judicial uses of insecticides to control rice insect pest. Concept of IPM was proposed by Stern et al., 1959 in sixties. Realizing the benefits of IPM, International Rice Research Institute, Phillippines has been advocating rice IPM techniques and demonstrating their efficiency in the farm level since 1980 (Samiayyan *et al.,* 2010). Considering the merits of rice IPM, efficacy and suitability of IPM modules was evaluated in irrigated ecosystem of Krishna district of Andhra Pradesh.

RESOURCES AND METHODS

On farm demonstration is one of the most effective extension tool to demonstrate and disseminate the new technology among stake holders. Technology transfer refers to the spread of new ideas from originating sources to ultimate users. The available technology should reach the farmers, the ultimate users through KVK activities and adoption of the technology by the farmers will reflect the feasibility of the technology. First and foremost, baseline survey was conducted to study the village conditions and problems in rice cultivation were identified. A list of paddy farmers has been prepared from the survey. Frontline demonstrations on integrated pest management (IPM) on rice were conducted involving 45 farmers of Raavivari palem and Sivaramapuram villages of Mopidevi mandal of Krishna district. Altogether totally 45 demonstrations were laid out over an area of 12 hectares.Krishi Vigyan Kendra, Ghantasala conducted Frontline demonstrations to demonstrate the efficacy of rice IPM technology on farmers' field under real farming situation during *Kharif* 2014 to 2016.

Further, KVK scientists selected the demonstration farmers. Before implementing the programme, awareness programmes and capacity building programmes were organized for the farmers. The grain yield was measured in kilogram with help of electronic weighing machine. The data so obtain were subjected to statistical analysis after necessary transformation for final statistical analysis.

OBSERVATIONS AND ANALYSIS

The data on effect of IPM technologies in frontline demonstrations on rice grain yield presented in Table 1 show that the yield ranged from 28.50 to 35.25 q/ha with average yield of 31.90 q/ha whereas in non- IPM module it was found to be 23.45 q/ha. There was 35.25 per cent more yield was recorded in IPM demonstrations plots than non-IPM demonstrations. The highest grain yield of rice 35.25 q/ha was recorded during *Kharif* 2016 in IPM module adopted demonstrations. This may be attributed to the adoption of IPM technology among farmers.

It has been observed that among IPM trained farmers, various cultural practices have wide spread adoption as against very low adoption of biological practices (Table 2). In cultural practices, more than two-thirds paddy farmers were found practising deep summer ploughing, trimming of bunds, destruction of crop residues

Table 1 : Evaluation of IPM module against non-IPM of rice

Year	Number of farmers	Area (ha)	Yield (q/ha)		% yield increase	Incremental cost benefit ratio	
			IPM	Non-IPM		IPM	Non-IPM
2014	15	4	28.50	21.50	32.56	1:2.25	1:1.85
2015	15	4	32.00	23.25	35.50	1:2.39	1:1.90
2016	15	4	35.25	25.60	37.70	1:2.53	1:1.98
Mean			31.90	23.45	35.25	1:2.39	1:1.91

and timely etc. Among the mechanical practices, pheromone traps were being used by only four per cent of farmers in paddy mainly because of farmers' poor knowledge about its use and non-availability of pest-specific lures. Use of biological control methods for pest control was observed at very low level in paddy crop. Farmers also complained about difficulty in using light traps in paddy due to their short-life as well as non-availability of bulbs. Trichogramma was the major bio-agent used in paddy IPM, but its adoption was found low in paddy. The major problems reported in its adoption were its slow action against the target pest, lack of easy availability, short shelf-life and low survival of these bio-agents on farmers' field. Similarly, use of *Neem*-based pesticide was also found very low (14%), mainly because of its slow action and lack of availability at local pesticide dealers. Only 28 per cent farmers reported using pesticides on the basis of economic threshold levels of pest infestation in paddy growing areas.

Table 2 : Adoption of integrated pest management practices in rice by the farmers

Practices	% of farmers
Cultural practices	
Deep summer ploughing, trimming of bunds, destruction of crop residues and timely planting	70
Use of resistant / tolerant varieties	56
Avoiding excess nitrogen application	34
Mechanical practices	
Use of pheromone traps	4
Use of light traps	11
Biological practices	
Release of *Trichogramma*	5
Use of neem products / *Neem* based products	14
Release of *Trichoderma*	0
Chemical control	
Use of pesticides based on ETL	28

Conclusion :

The results of present study led to conclusion that the yield losses due to major pests can be managed by the adoption of IPM modules. After adoption of the IPM module gradual increase in the yield was observed over the years. It has been observed that among IPM trained farmers, various cultural practices have wide spread adoption as against very low adoption of biological practices. Trichogramma was the major bio-agent used in paddy IPM, but its adoption was found low in paddy. The major problems reported in its adoption were its slow action against the target pest, lack of easy availability, short shelf-life and low survival of these bio-agents on farmers' field. It was also concluded that the demonstrated IPM module is eco-friendly and safer to non-targeted organism in comparison to conventional insecticides.

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