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Original Research Article

Evaluation of IPM Module against Major Rice Insect Pests of Rice in St. Kabir Nagar District of Uttar Pradesh

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Keywords

Yellow Stem Borer, Dead Heart, White Ear, Scirpophaga incertulas, Leaf Folder

A B S T R A C T

Krishi Vigyan Kendra, St. Kabir Nagar conducted Frontline demonstrations to demonstrate the efficacy of rice IPM technology on farmers' field under real farming situation during kharif 2014 and 2015. IPM module comprising of seed treatment with carbendazim @ 4 g/kg seed, application of broad spectrum weedicide Pretilachlor 50 EC @ 500 ml/acre 2-3 DAT, pheromone traps with 5 mg lure @ 20 traps/ha against yellow stem borer for mass trapping and need-based spraying of Hexaconazole @ 1 ml/l against sheath blight found effective against yellow stem borer and leaf folder of rice. Minimum incidence of stem borer (6.38 to 5.32 % dead hearts, 8.85 to 8.25 % white ears) and leaf folder (3.25 and 2.56 % leaf folder damaged leaves at 50 DAT) was recorded in IPM module demonstrated plots. Higher mean grain yield was also recorded in IPM module adopted farmers field.

Introduction

Rice (*Oryza sativa* L.) is the prominent cereal crop of the world and rice productivity improves considerable since its domestication about 8000 years ago. It is not only the staple food of more than 2/3rd population world and but also the major source of nutrition of rice eating people of South and South East Asia. India is the second largest producer and consumer of rice grown in the world after china. In 2011-12 India produced about 104.3 million ton of rice which accounts for 22.81% of total global rice production. Uttar Pradesh is the 2ndlargest rice producing state of the country with an area of 5.9 million ha under rice cultivation. The average rice productivity of the state is 2.80 t/ha. The major biotic factors contributing to yield loss in rice production are pests, diseases and weeds. Among diseases of rice sheath blight, bacterial leaf blight and blast are the major diseases of rice in irrigated ecosystem while weeds like *Cyperus iria, C. rotundus, Cloeme viscosa, Echinochloa crusgalli, Eclipta alba, E. colona,* and *Fimbristylis dichotomy* are also limiting rice productivity in rice growing areas of Uttar Pradesh. Yellow stem borer and leaf folder are the major Insect pests of rice in all the prevailing ecosystem of rice cultivation in Uttar Pradesh. Yellow stem borer, *Scirpophaga incertulas* (Walker) (Lepidopter: Pyralidae) is a monophagous rice pest and attacking the rice crop at every

growth stages of the crop. The larvae of yellow stem borer bore or successfully tunneled into stem and feed on the inner tissue of the stem. The damage symptoms depends on the crop growth stage at which larvae infested the crop. Stem borer infestation at vegetative stage of crop produces dead heart symptoms while infestation at reproductive stage produces white ear. Infestation of *Scirpophaga incertulas* at reproductive stage causes severe yield loss and full potential of the variety cannot be achieved. Yield loss of 18 to 40% was reported due to the infestation of yellow stem borer. The rice leaf folder, *Cnaphalocrocis medinalis* (Guenee) earlier considered as a minor pest has gained the status of major pest with the widespread of high yielding rice varieties and hybrids (Teng *et al.,* 1993). Yield loss of 18.30 to 58.40% was estimated due to the infestation of leaf folder which depends upon the stage of the crop at the time of infestation (Ramasamy and Jaliecksono 1996). For the control of leaf folder and yellow stem borer, many methods have 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 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 eco-friendly 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. It is implemented by utilizing sound ecological approaches which is aimed at optimizing control measures rather than maxizing them. 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 St. Kabir Nagar district of Uttar Pradesh.

Materials and Methods

Krishi Vigyan Kendra, St. Kabir Nagar conducted Frontline demonstrations to demonstrate the efficacy of rice IPM technology on farmers' field under real farming situation during kharif 2014 and 2015. On farm demonstration is one of the most effective extension tool to demonstrate and disseminate the new technoilogy among stake holders (Chizari *et al.,* 1999; Eke and Emah, 2001). Technology transfer refers to the spread of new ideas from originating sources to ultimate users (Prasad *et al.,* 1987). 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 (Mazumder *et al.,* 2012). Frontline demonstrations on integrated pest management (IPM) on rice were conducted involving 30 farmers of Singhapur village of Nath Nagar block of St. Kabir Nagar district. Altogether Totally 30 demonstrations were laid out over an area of 12 hectares. Before demonstration, baseline survey was conducted and problem associated with rice cultivation were identified. Socio economic status of adopted farmers was also studied before demonstration. The majority of the farmers of study areas are marginal and resource

poor. A probable list of interested farmers has been prepared from the survey. Further, KVK scientists visited the land of the selected farmer in presence of the villagers. Before implementing the programme, the skill training programmes were organized involving the selected farmers. Field days and other extension programmes were also organized inviting the farmers of the said and nearby villages, Soil samples were collected before transplanting from 15 and 30 cm depths. Processed soil samples were analysed for pH, (EC), organic carbon, available N, P and K. The pH of the soils ranged from 7.2-8.4, and organic carbon (%) ranged from 0.33-0.45. The status of soil organic carbon was low in all the soil samples. The available N, P and K contents of the soil varied from 165-232 kg/ha, 20-32 kg/ha and 180-248 kg/ha. Since the balanced use of these nutrients was essential for realizing the full potential of the variety, fertilizer recommendation on the basis of soil test data was recommended.

The experimental material was consist s of two treatment schedules viz IPM and non-IPM (conventionally cultivated farmers' practice). IPM module included seed treatment with carbendazim @ 4 g/kg seed, application of broad spectrum weedicide Pretilachlor 50 EC @ 500 ml/acre 2-3 DAT, pheromone traps with 5 mg lure @ 20 traps/ha against yellow stem borer for mass trapping and need-based spraying of Hexaconazole @ 1 ml/l against sheath blight. Popular rice variety of area 'Kalanamak' was used as test variety. The observations on pests, diseases and yield data were recorded from IPM and non-IPM demonstrations. The data on stem borer infestation was recorded at vegetative stage as dead heart (DH) and total tillers and per cent incidence was worked out. Similarly, white ear (WE) and panicle bearing tillers were recorded near maturity of crop and per cent white ear infestation was worked out. Leaf folder damage was recorded from randomly selected 10 hills from each plot. For this, total number of leaves per hill and infested leaves were recorded and per cent incidence was worked out. The data on grain yield of each plot were recorded separately by threshing the harvested Pusa basmati -1 on tarpaulin followed by proper sun drying and winnowing. 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 (Gomez and Gomez 1984).

Results and Discussion

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 31.88 q/ha whereas in non-IPM module it was found to be 23.55 q/ha. There was 35.35 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 2015 than kharif 2014 (28.50 q/ha) in IPM module adopted demonstration. This may be attributed to the adoption of IPM technology among farmers.

Observations on incidence of yellow stem borer and leaf folder presented in table -2 revealed that the incidence of YSB at the vegetative stage ranged from 5.85% to 11.83 % DH. Maximum Dead Heart% was recorded in non IPM plots i.e. the plots in which farmers practice were adopted to control the yellow stem borer while the minimum dead heart % (DH%) was recorded in IPM module adopted demonstrations during both the years of study. The Mean % White ear at pre harvest was ranged from 7.50 to 17.88.

Table.1 Evaluation of IPM module against major insect pest 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	6	28.50	21.50	32.56	1:2.25	1:1.85
2015	15	6	35.25	25.60	37.70	1:2.53	1:1.98
Mean			31.88	23.55	35.35	1:2.39	1:1.92

Table.2 Effect of IPM treatments on major insect pest of rice

IPM Module	% Dead Heart (DH) at 60 DAT		Mean % Dead Heart at 60 DAT	% WE at Pre Harvest		Mean % WE at Pre Harvest	% Leaf Folder Damaged Leaves at 50 DAT		Mean % Leaf Folder Damaged Leaves at 50 DAT
	2014	2015		2014	2015		2014	2015	
IPM	6.38	5.32	8.85	8.25	6.75	7.50	3.25	2.56	2.91
Non IPM	12.5	11.15	11.83	18.25	17.5	17.88	7.58	8.15	7.87
CD (P=0.05)	**5.65**	**7.35**		**8.15**	**5.45**		**7.73**	**7.32**	

Minimum % WE was recorded with IPM module in both the years of study (8.25, 2014 and 6.75, 2015). Minimum leaf folder damaged leaves were recorded in IPM module demonstration plot as compared to farmers practice adopted plots. The adoption of IPM technologies resulted in higher net income in economic terms also which was exhibited by high incremental cost benefit ratio 1: 2.25 and 1: 2.53 during kharif 2014 & 2015 respectively. Similar finding was also reported by Dash *et al.,* 2005, Dash *et al.,* 2006, Karthikeyan *et al.,* 2010.

The results of present study led to conclusion that yellow stem borer (*S. incertulas) and* leaf folder (*Cnaplocrosis medinalis* Guenee) are one the major pest of rice in irrigated and rainfed lowlands rice. The yield losses due to these pests can be managed by the adoption IPM modules. 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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