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Research Note

Biological control of rice pests in '*Kole*' lands of Kerala

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ABSTRACT: Large scale demonstrations of biological control based integrated pest management (BIPM) practices were carried out in the '*kole*' lands of Koorkkencherry *Panchayath* of Thrissur district in Kerala and compared with conventional farming. *Trichogramma japonicum* was released against rice stem borer and leaf folder @ 1 lakh ha^{-1}. The results showed that dead heart and white ear head incidences were on par in the two systems of cultivation. In the case of leaf folder significantly lower incidence was observed in BIPM. There was no significant difference in grain yield. The population of predators like coccinellids and spiders were significantly higher in BIPM.

KEY WORDS: Biological control, rice pests, '*Kole*' lands

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INTRODUCTION

Kerala is one of the agriculturally important states of southern India having a rich biodiversity. Kerala's economy is predominantly agrarian in nature with nearly 50 per cent of the state's population depending upon agriculture. '*Kole*' lands are low lying tracts located 0.5 to 1m below the mean sea level and form the rice granary of central Kerala. The term '*kole*', a *malayalam* word, denotes bumper yields or high returns under favourable conditions, otherwise a complete loss. The major rice crop raised in the '*kole*' land is the '*punja*' crop starting from December/January to April / May. Rice cultivation in '*kole*' lands begins after the southwest monsoon, after dewatering or pumping out of water with the help of bunds and canals. The entire area remains flooded during southwest monsoon. The cultivation of the '*kole*' land area is associated with a number of constraints which can cause complete loss of the crop. In spite of the risks involved, farmers are enthusiastic about the cultivation because of the high inherent fertility of the soil which can produce bumper yields in favourable season (Johnkutty and Venugopal, 1993).

Major pests such as rice stem borer and leaf folder are the most important limiting factors in attaining potential yield in '*kole*' lands. Farmers are relying mostly on chemical pesticides for pest and disease management. The continued use of synthetic pesticides in the '*kole*' land ecosystem is detrimental to the rich biodiversity of beneficial arthropod fauna in the ecosystem. Studies conducted earlier revealed that *Trichogramma japonicum* is promising for the control of leaf folder and stem borer in rice (Anon., 2004). Keeping the above facts in mind, large scale demonstrations on biological control based integrated pest management (BIPM) were carried out in '*kole*' lands of Kerala, and compared with the accompanied neighbourhood conventional system of cultivation (Non IPM).

The farmer participatory demonstration experiments were carried out with *Jyothi* rice variety in the '*kole*' lands in an area of five hectares for three consecutive seasons from 2006 to 2009. In BIPM plots, seed treatment was done with *Pseudomonas fluorescens* @ 8g kg^{-1} of seed. Releases of *T. japonicum* @ 1 lakh ha^{-1} were initiated after observing one egg mass or one moth / m^2 of stem borer and two freshly damaged leaves / hill of leaf folder. Four releases were made at fortnightly intervals. In conventional farming the farmers used triazophos @ 625ml ha^{-1} against leaf folder and chlorpyrifos @ 0.02% against stem borer. Azadiractin (*Econeem* plus @0.002%) was applied against rice leaf thrips in the early stages of the crop in both the cultivation practices. In BIPM, farmers used organic manures such as green leaves @ 4 t ha^{-1} and neem cake 250 kg/ha in addition to chemical fertilizers. Observations were recorded from BIPM plots and non-IPM plots on the incidence of dead hearts, white ear heads and leaf folder damage at 15 days

interval starting from the imposition of treatments. Five plots of 40 m^2 were randomly selected as replications from the five hectare area and each plot was divided into 10 subplots. From each subplot 15 hills were observed. Population of spiders and coccinellids was recorded from each hill before and after applying the treatments. Grain weight and total ear heads were recorded and the data were analyzed statistically.

Observations on dead heart and white earhead incidences showed that there was no significant difference in stem borer incidence in the two systems of pest management practices. Lyla *et al.* (2000) reported similar results from Kerala and Kaur *et. al.* (2007) also reported that the per cent dead hearts in biointensive pest management practice fields were on par with chemical control field in Panjab. In the case of leaf folder, the pooled analysis of three years' data proved the effectiveness of *T. japonicum* in the management of the pest and it was significantly lower in BIPM (Table 1) as reported earlier (Anon., 2004). Rajendran (1992) found that *T. japonicum* releases reduced the leaf folder incidence. According to Kaur *et al*. (2007) the incidence of leaf folder was lower in organic plots as compared to inorganic fertilizers applied plot, as in the present study.

Predators like coccinellids and spiders were significantly more abundant in BIPM plots during the three years (Table 2). Beevi *et al*. (2000) reported that spiders and coccinellids constituted a large proportion of predators in rice fields. *Micraspis crocea* (Mul.), *Harmonia octomaculata* (Fab.) and *Cheilomenes sexmaculatus* (Fab.) were the common predatory coccinellids in the '*kole*' lands of Thrissur. Spiders such as *Lycosa pseudoannulata* (Boes. and Strand), *Tetragnatha maxillosa* Thorell, *Oxyopes* sp. and *Phidippus* sp. were recorded.

There was no significant difference in grain yield in the two systems of cultivation during the three years (Table 1), as recorded by Kaur *et al.* (2007). The results of the three years show the effectiveness of *T. japonicum* for the management of stem borer and leaf folder at the applied dose. The farmers in Koorkkencherry area were convinced in pesticide-free rice cultivation and biocontrol technologies. The farmers are now practicing BIPM technologies in vast areas in '*kole*' lands of Thrissur and the '*kole*' land ecosystem

Table 1. Details of pest incidence and yield parameters

Observations	Cultivation practices	2006-07	2007-08	2008-09	Mean	Significance (t-test)
Dead heart %	BIPM	1.03	0.97	1.95	1.32	NS
	Non IPM	1.39	1.04	1.94	1.46	
Leaf folder %	BIPM	0.10	0.66	0.81	0.54	S
	Non IPM	0.85	0.77	1.26	0.96	
White ear head / sq.m	BIPM	2.80	0.27	1.33	1.47	NS
	Non IPM	4.53	1.40	2.60	2.84	
Grain yield kg^{-1}	BIPM	7967.33	6969.3	6064.67	7000.45	NS
	Non IPM	7988.67	6094.0	5633.33	6572.00	

NS – Non-significant. S – Significant at 5%

Table 2. Details of predatory population

Observations	Cultivation practices	2006-07	2007-08	2008-09	Mean	Significance (t test)
Coccinellids / hill	BIPM	0.52	0.32	0.35	0.40	S
	Non IPM	0.07	0.05	0.05	0.06	
Spiders / hill	BIPM	0.32	0.19	0.41	0.31	S
	Non IPM	0.05	0.05	0.09	0.06	

S – Significant at 1%

is now returning to normal with its unique and rich biodiversity.

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REFERENCES

Anonymous, 2004. Annual Report, Project Directorate of Biological Control, Bangalore. p. 65

Beevi, S. P., Lyla, K. R. and Prabhakaran, P. V. 2000. Quantification of pests and natural enemies of rice ecosystems, pp. 617–621. In: Das, M. R. (Ed.). *Proceedings of 12th Kerala Science Congress*, 27–29 January 2000, Kumaly, Kerala State Committee on Science, Technology & Environment, Govt. of Kerala, India.

Johnkutty, I. and Venugopal, V. K. 1993. *Kole lands of Kerala*. Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, 68 pp.

Kaur, R., Brar, K. S., Singh, J. and Shenhmar, M. 2007. Large scale cultivation of bio–intensive management for leaf folder and stem borer in basmati rice. *Journal of Biological Control*, **21**: 255–259.

Lyla, K. R., Beevi, S. P. and Joy, P. J. 2000. Effect of biocontrol in rice pest management, pp. 560–562. In: Das, M.R. (Ed.). *Proceedings of the 12th Kerala Science Congress,* 27–29 January 2000, Kumaly, Kerala State Committee on Science, Technology & Environment, Govt. of Kerala, India.

Rajendran, B. 1992. Parasitisation efficacy of *Trichogramma japonicum* on rice leaf folder *Cnaphalocrocis medinalis*. *Indian Journal of Agricultural Sciences*, **63**: 97–98.