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Field evaluation of bio-effectiveness of acephate 75% SP against insect pests of rice crop

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Abstract

A field experiment was conducted at University Experimental Farm, 'C' Unit, BCKV, Kalyani, Nadia, West Bengal to evaluate insecticide molecules against yellow stem borer, Leaf folder and hopper pest in rice variety "IET-4786" comprising seven treatments including control and three replication in randomized block design. Experimental results revealed that Acephate 75% SP (KREPL) applied @ 750 g a.i./ha gave best results for insect population control viz. count of % dead hearts at 45 DAT (2.13%), white ear head count at harvest (1.54%) due to the incidence of yellow stem borer, GLH, Hopper population count (1.63 and 2.94 respectively) and grain yield/ha (34.51q/ha), followed by Acephate 75% SP (KREPL) @ 500 which recorded 3.58% dead hearts, 1.86% white ear heads at harvest, 2.28% leaf damage by leaf folder, 1.85 and 3.24 GLH and hopper scoring respectively compared to Fipronil 5% EC and Chlorpyrifos 20% EC which was moderately effective in controlling rice pests.

Keywords: stem borer, leaf folder, green leaf hopper, acephate, bio-efficacy

Introduction

Rice is the most important food crop in India and on research, and production priority for national food security. Rice contains protein name gluten (8.1%), Vitamins, minerals, fibers (2.2%) and lots of carbohydrates (77.1%) with a total of 349 calories. Rice crop is highly sensitive for several insect pests Singh and Singh, (2015) [1]; Singh and Singh, (2017) [2]. The major factors that have contributed towards changes in the pest scenario are extensive cultivation of high yielding varieties, growing of varieties lacking resistance to major pests, intensified rice cultivation throughout the year providing constant niches for pest multiplication, imbalanced use of fertilizers, particularly application of high levels of nitrogen, injudicious use of insecticides resulting in pest. Resistance to insecticides, and resurgence of pests and outbreaks of minor pests Prakash *et al.*, (2014) [3]. The number of insect pests recorded during this survey clearly shows the damage intensity caused by insects, this survey report will support for making the decision for management of major insects.

Insects are the most diverse group of animals living on earth. They are undoubtedly the most adaptable form of life as their number exceeds that of any other category. Among the major insect pests of rice are stem borers like yellow stem borer-YSB (*Scirpophaga incertulas*), belong to order Lepidoptera is the most destructive pest found all over the world. The presence of these insects in our field is easily identified by "dead heart" or "white ear" in hills at vegetative stage and panicle at reproductive stages respectively Sulagitti *et al.*, (2018) [4]. The *Cnaphalocrocis medinalis* (Leaf folder) belongs to order Lepidoptera also observed during both stages and feed inside the leaves make a fold. a few can transmit viral diseases. Among these, Green leafhopper, *Nephotettix virescens*, Brown plant hopper, *Nilaparvata lugens* (Stal), cause the significant economic damage in rice (Das and Mukherjee, 2009) [5]

Among the various strategies adopted to combat the pest of rice, insecticides are the first line of defence. Most of the insecticides used on agricultural crops are based on a limited number of chemically different classes out of them the most important in organic insecticides that are used against the pest on rice belongs to synthetic pyrethroids. Therefore an effort has been made in present investigation to evaluate the new formulation of chemical insecticides such as Acephate 75% SP at different dose rates supplied by M/s Krishi Rasayan Exports Pvt. Ltd (KREPL) against rice yellow stem borer, leaf folder and Leaf hoppers in rice.

Materials and Method

A field experiment was conducted at University Experimental Farm, 'C' Unit, BCKV, Kalyani, Nadia, West Bengal to evaluate insecticide molecules against yellow stem borer, Leaf folder and hopper pest in rice variety "IET-4786" comprising seven treatments including control and three replication in randomized block design during summer 2017. Two rounds of applications were given one at active tillering upon the appearance of leaf folder when the pest status reached beyond ETL (one damaged leaf per hill) and second at panicle initiation stage.

To record the incidence of pests, two rows were discarded on all sides as border rows. Then 20 hills were selected randomly

on diagonals for counting of dead hearts and white ear heads/hill. To assess Stem borer damage, total no. of tillers /hill were counted and total no. of dead hearts and white ear heads/hill were also counted and % dead hearts and % white ear heads were calculated. Observations on leaf folder population were recorded based on % leaf damaged/hill from 20 random hills and put in 0-9 scale. The incidence of GLH and hoppers/hill was recorded by visual sampling method and put on scoring in number in 0-9 scale (Fig 1).

The data thus collected were converted into percent damage index. The data on pest incidence and yield were subjected to analysis of variance after making necessary transformations wherever needed.

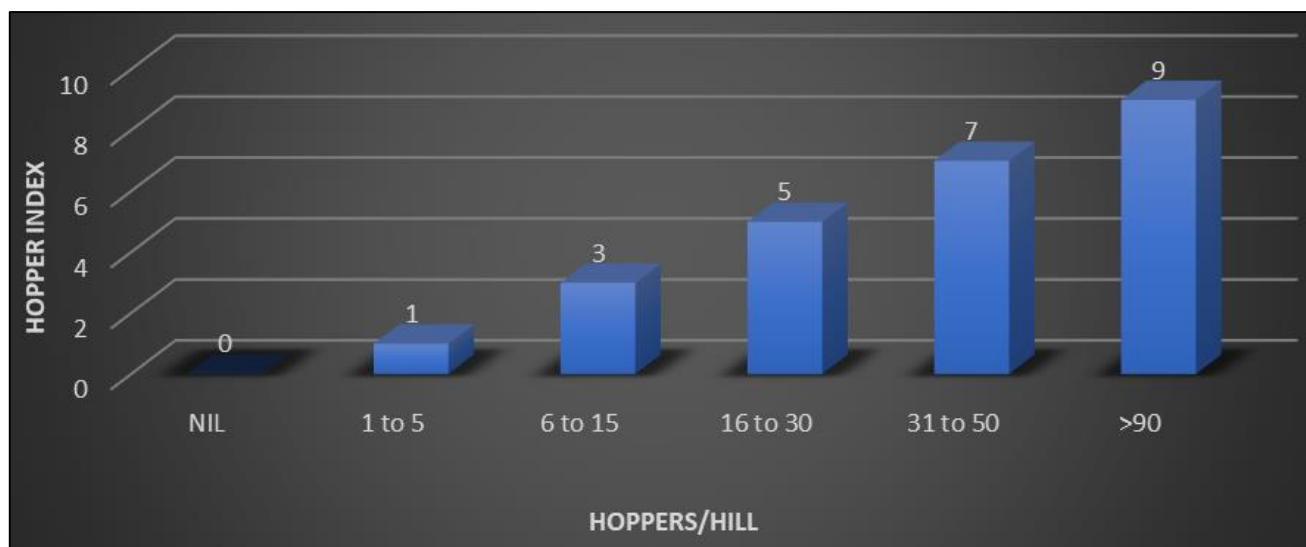


Fig 1: Visual scoring of GLH and hoppers population per hill

Table 1: Treatment details for bio-efficacy evaluation of Acephate 75% WP (KREP) against various insects in Rice crop

Sl. No.	Treatments	Dosage (gm ai/ha)	Dosage Formulation (gm. ml./ha)	Water dilution (liter/ha)
T ₁	Acephate 75% SP (KREPL)	350	467	500
T ₂	Acephate 75% SP (KREPL)	500	666	500
T ₃	Acephate 75% SP (KREPL)	750	1000	500
T ₄	Acephate 75% SP (Market sample)	750	1000	500
T ₅	Fipronil 5% EC	75	1500	500
T ₆	Chlorpyrifos 20% EC	250	1250	500
T ₇	Control (Untreated)	-	-	500

Results and Discussion

The data recorded for per cent dead hearts count at 45 DAT, white ear head count at harvest caused by yellow stem borer, leaf folder larvae damage index, green leaf hopper, hoppers population has been presented in Tables 2. It was observed that all the treatments showed significant reduction in the pest incidence in rice crop. But Acephate 75% SP (KREPL) applied @ 750 g a.i./ha gave best results for insect population control viz. count of % dead hearts at 45 DAT (2.13%), white ear head count at harvest (1.54%) due to the incidence of yellow stem borer, GLH, Hopper population count (1.63 and 2.94 respectively) and grain yield/ha (34.51q/ha), followed by Acephate 75% SP (KREPL) @ 500 which recorded 3.58% dead hearts, 1.86% white ear heads at harvest, 2.28% leaf damage by leaf folder, 1.85 and 3.24 GLH and hopper scoring respectively. There was no significant difference between these two treatments but superior to Acephate 75% SP (Market sample) @ 750g. a.i./ha treatments. Other treatments were also superior over untreated control for controlling stem borer, leaf roller, GLH and Hopper

population in rice crop. It was observed that Acephate 75% SP (KREPL) @ 500 g.a.i./ha and 750 g.a.i./ha was relatively safe to bio-agents which was envisaged by good percentage recovery of parasitized eggs and larvae during trail period.

Maximum paddy yield was recorded in the treatment of Acephate 75% SP KREPL @ 750 gm. a.i./ha having 33.24 q/ha closely followed by Acephate 75% SP (KREPL) @ 500 gm. a.i./ha with 32.71q/ha and both are statistically at par with each other. Acephate 75% SP (Market sample) @750 gm. a.i./ha gave 29.56 q/ha. Whereas in the treatments of Fipronil 5% EC and Chlorpyrifos 20% EC @ 250 gm a.i./ha paddy yield was 28.65q/ha and 27.15 q/ha respectively

It is evident from the study that Acephate 75% SP KREPL @ 500 and 750 g a.i./ha gave over all satisfactory control of yellow stem borer, leaf folder, hoppers and green leaf hopper damage in rice crop. The pest damage control resulted in excellent yield increase. Acephate 75% SP (KREPL) @ 500 and 750 g a.i./ha was at par in efficacy and yield increase and can be recommended for the management of yellow stem borer leaf folder, hoppers and green leaf hopper incidence in

rice crop.

The results of the experiment agreed with the findings of Jeer *et al.*, 2017 [6]; Seni and Naik, 2017 [7]; Kumari *et al.*, 2019 [8]; Patidar *et al.*, 2018 [9]; Badariprasad *et al.*, 2020 [10]; Subhash

et al., 2017 [11] who also reported that acephate is very effective in the management of insect pests of rice in singly or in combination with other insecticides.

Table 2: Evaluation of Bio-efficacy of Acephate 75% SP (KREPL) against major pests of rice, During Kharif, 2017 at University Experimental Farm, 'C' Unit, BCKV, Kalyani, Nadia, West Bengal (Mean of four applications and three replications)

Sl. No.	Treatment	Dose (g a.i./ha)	% leaf damaged index of leaf folder	% dead heart at 50 DAT	% white ear head at harvest	GLH scoring	Hoppers scoring	% Parasitisation by natural enemies		Yield (q/ha)
								Egg	Larva	
T ₁	Acephate 75% SP (KREPL)	350	5.12 (12.82)	6.22 (14.32)	3.41 (10.01)	4.13 (2.06)	4.84 (1.66)	58.54 (49.56)	17.46 (24.38)	30.21
T ₂	Acephate 75% SP (KREPL)	500	2.28 (8.57)	3.58 (10.67)	1.86 (7.99)	1.85 (1.50)	3.24 (1.38)	56.24 (48.39)	16.98 (23.66)	33.58
T ₃	Acephate 75% SP (KREPL)	750	1.65 (7.80)	2.13 (8.35)	1.54 (6.32)	1.63 (1.42)	2.94 (1.91)	57.41 (48.75)	17.46 (24.22)	34.51
T ₄	Acephate 75% SP (Market sample)	750	3.58 (10.19)	5.16 (12.93)	2.56 (9.12)	2.49 (1.59)	3.01 (1.45)	58.51 (47.89)	15.16 (22.80)	29.56
T ₅	Fipronil 5% EC	75	4.10 (10.04)	9.12 (16.86)	4.19 (10.37)	3.19 (1.88)	4.51 (1.90)	44.46 (42.50)	9.85 (18.76)	28.65
T ₆	Chlorpyrifos 20% EC	250	4.12 (10.84)	8.65 (17.20)	3.63 (11.00)	3.49 (1.91)	5.23 (1.98)	23.12 (28.95)	6.52 (12.86)	27.15
T ₇	Untreated control	-	12.03 (19.41)	23.23 (29.49)	11.24 (18.64)	6.23 (2.45)	7.29 (2.39)	63.25 (51.50)	19.25 (25.13)	23.25
CD at 5%			1.19	1.45	1.22	0.32	0.19	1.65	1.84	1.35

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