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COMPARATIVE EFFICACY OF FEW CHEMICALS ON BROWN PLANT HOPPER, *NILAPARVATA LUGENS* STALL INFESTING PADDY CV MTU- 1001 AT FARMERS FIELD OF BARGARH DISTRICT, ODISHA.

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ABSTRACT: Replicated field trials were conducted at Kujapali village of district Bargarh to study the comparative efficacy of few insecticides in controlling BPH / WBPH infesting Paddy crop cv MTU-1001 during Rabi 2012-13 and Rabi 2013-14. A total of six treatments viz.Acephate, 75 SP, imidacloprid 17.88 L, Buprofezin 25 SC, Denotifuran 20 SG, Glamour 80 WG including one farmers prioritized treatment was taken. Data on yield (qtls/ ha) and mixed population of BPH & WBPH / hill was recorded before 1day and after 7 days of spraying. The study indicated that Buprofezin 25 SC recorded highest pooled yield of 48.24 qtls/ ha followed by Acephate 75 SP (47.52 qtls/ ha) which were statistically at par and the lowest yield recording treatment was T6 *i.e*. application of Glamour 80 WG, with an yield of 43.00 qtl/ ha. Plots receiving farmers practice recorded 46.58 qtl/ha with lowest cost benefit ratio during both the years of study.

Key words- BPH, WBPH, Buprofezin

INTRODUCTION

Rice (*Oryza sativa* L.) is an important staple food crop for more than half of the world population and accounts for more than 50% of the daily calorie intake (KHUSH, 2005). Approximately 21% of the global production losses of rice are attributed to the attack of insect pests (YARASI *et al.,* 2008). The brown plant hopper (BPH), *Nilaparvata lugens* stal is an important insect pest of paddy of all ecosystems and since 1972, extensive yield losses due to attack of this pest is reported from all parts of the country (PRAKASH *et al*., 2014). In Odisha, BPH along with WBPH, *Sogatella furcif*era, Hovarth, is an important pest of rice in Hirakud command area as well as in coastal tract where intensive cultivation is practiced along with irrigation facility and heavy doses of nitrogen fertilizers. Among the 20 serious insect pests of rice, both BPH & WBPH (Homoptera: Delphacidae), are considered to be most destructive insect pests in Asian countries (PARK *et al*., 2008) also causing significant yield loss in wet and dry seasons of Odisha including Hirakud command area. In past years major out breaks of BPH were recorded in several rice growing countries like China, Korea, Japan, India, Indonesia, Malaysia, the Philippines, Thailand and Vietnam (HEONG and HARDY, 2009).

Insecticides are the major dependable tools in managing these insect pests and several insecticides belonging to different classes were reported to be effective (KRISHNAIAH *et al*., 2008; PRAKASH *et al*., 2016). The insecticides though effective, their large scale and continuous use either causes pest resurgence (TANAKA *et al*., 2000) or the insect developed resistance to insecticides (MATSUMURA *et al*., 2008 and LAKSHMI *et al*., 2010) and thus aggravating the BPH problem. Hence, there is a regular need to evaluate new groups of insecticides with different modes of action. All type of cultural control measures including resistant variety are very often failed and this situation

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compelled farmers for use of pesticides indiscriminately in improper methods including tank mixture of several types (NAGATA, 1982). In certain pockets of the Hirakud command area including Bargarh district, total pesticide application ranges from 6-8 times after weeding till harvesting and lions share goes to controlling this pest which ultimately reduces profit. Hence, in the present study we evaluated the efficacy of some common insecticides at their recommended doses against this pest.

MATERIALS AND METHODS

The experiment was laid at farmers' field of Kujapali village of Bargarh district during Rabi 2012-13 and 13-14 located in the command area and witnesses intensive cultivation of paddy throughout the year. One popular variety of paddy, MTU-1001 grown during summer season in this area was chosen for study. Six insecticide treatment schedules including one farmers practice were fixed at each farmers field of the 5 selected farmers and the details of the treatment schedule is mentioned at Table-1. Two to three seedlings were planted per hill with a spacing of 15x15cm during Rabi season of both the years of study. The fertilizers, N: P: K was used @120:60:60. The test insecticides were applied twice as foliar spray with a knapsack sprayer @ 500 litres spray fluid / hectare at appropriate stage based on the plant hoppers build-up to ETL. Care was taken to avoid drift of spray solution to adjacent plots First application of pesticide was done at appearance of the pest at ETL (5-10 insects / hill) and second application was done after 10 days of the first application in an area of 5X5 m^2. Observation on no. of mixed population of BPH & WBPH / hill was taken one day before treatment (DBT) and 7 days after the insecticide application (DAT) from 20 randomly selected hills of each treatment and mean no of BPH, WBPH / hill was calculated Percentage reduction is BPH and WBPH population was calculated by using the following formula.

$$\frac{\text{No of pest / hill at IDBT- Av. No of pests / hill at 7 DAT}}{\text{Av. no of pest / hill at IDBT}} \times 100$$

Yield data was taken from the peg marked treated site of 5m X 5m and converted to per has yield (qtl/ha). Yield and pest data was subjected to statistical analysis in randomized block design as per the procedure of SNEDECOR and COCHRON (1967). The data on planthoppers (BPH and WBPH) were collected from 20 randomly selected hills from each plot at one day before and seven days after the treatment. Before harvest of the crop, the hopper burn hills and healthy hills were counted separately in each plot and per cent hopper burn area was computed. The data on on percentages of hopper burn area was transformed to Arc Sine values. Similarly, grain yields were recorded from net plot area of 25m^2 during *Rabi* of both the years of experimentation and converted to qtls/ha.

RESULTS AND DISCUSSION:

The average no of BPH/WBPH population / hill during both the years of study was much higher than ETL before spraying (IDBT) and varied from 14.30 (T_3) to 17.12 (T_5) during Rabi 2012-13 and 16.25 (T_2) to 18.55 (T_4) during Rabi 2013-14, respectively (Table-1). Buprofezin was most efficient among all in reducing BPH population to the tune of 82.01% and 83.18% during first and second year of investigation respectively. Acephate, the conventional organophosphate used for controlling this pest was also performed satisfactorily in the beginning to bring down the pest population to the tune of 79.46% and 80.61% during first and second year of study as well as recorded second highest yield (49.50 qtl/ha) during second year of study. In the present context farmers practice which involves tank mixture of minimum 2 of the tested chemicals along with a synthetic pyrethroid or organophosphate insecticide followed by topical application of potash also recorded satisfactory yield as well as pest control although it is lower than

Table-1: Comparative efficacy of insecticides on BPH and WBPH population and on yield of paddy cv. MTU 1001 at Bargarh, Odisha

Treatment No.	**Details of the insecticide**	**Group**	**dose**	**Year 2012-13 Rabi**			**Year 2013-14 Rabi**			**Yield (qtl/ha)**			**Cost benefit ratio**	
				BPH Population *			**BPH Population ***							
		-		**1 DBT**	**7 DAT**	**% reduct-ion in pp**	**1 DBT**	**7 DAT**	**% reduction in population**	**Rabi 2012-13**	**Rabi 2013-14**	**Pooled mean over 2 years**	**2012-13**	**2013-14**
T1	Farmers practice	Nil	No fixed dose overdose and tank mixture.	15.37	3.21	79.11	18.00	4.32	46.00	47.90	45.25	46.58	1:1.23	1:1.35
T2	Acephate 75sp	O.P	2.5 gm/ lit. (500gmai/ha)	17.21	3.53	79.48	16.25	3.15	80.61	49.50	46.15	47.52	1:2.12	1:2.04
T3	Immedaloprid 17.8SL	Neonico-tinoid	0.25 mi/ lit(25gmai/ha)	14.31	3.76	73.72	17.23	3.85	77.65	47.30	46.15	46.72	1:1.89	1:1.79
T4	Buprofezin 25 SC	Chition synthesis inhibitor	1.5 ml/ lit (125gmai/ha)	16.46	2.96	82.01	18.55	3.12	83.18	49.20	47.27	48.24	1:2.22	1:2.34
T5	Denotifuran 20 SG	Neonico-tinoid	0.4 gm/ lit	17.12	3.96	76.86	16.95	4.53	73.27	46.40	41.90	44.15	1:1.76	1:1.61
T6	Glamour 80 wg (Ethiprole40wg + Imidacloprid40w g)	Phenyl pyrazale +neo nicotinoid	0.25 gm/lit	16.61	3.87	76.70	18.12	4.67	74.22	43.20	42.80	43.00	1:1.65	1:1.75
SEM (±)				0.831	0.501		0.727	0.783			0.832	1.082		
CD (P=0.05)				2.44	1.49		2.13	2.30			2.44	3.18		

*Each figure is the mean of 3 applications.

Table-2: Efficacy of different insecticide application on predatoty mirid bug (*Cyrtorrhynus lividipennis*) population of BPH infesting paddy cv.MTU 1001at Bargarh, odisha

Treatment No.	**Details of the insecticide**	**Group**	**dose**	**Year 2012-13 Rabi**			**Year 2013-14 Rabi**				**Hopper burn area (%)**		
				Mirid Population *			***Mirid population**						
		-		**1 DBT**	**7 DAT**	**% reduct-ion in pp**	**1 DBT**	**7 DAT**	**% reduction in popular-tion**	**Pooled mean of 2years**	**Rabi 2012-13**	**Rabi 2013-14**	**Pooled mean over 2 years**
T1	Farmers practice	Nil	No fixed dose overdose and tank mixture.	5.37	1.21	77.46	8.00	4.32	46.00	61.73	2.45 (6.44)	2.95 (8.43)	2.7
T2	Acephate 75sp	O.P	2.5 gm/ lit. (500gmai/ha)	15.21	13.53	11.04	16.85	13.15	21.95	16.49	0.1 (1.81)	0.1(1.81)	0.1
T3	Immedaloprid 17.8SL	Neonicotinoid	0.25 mi/ lit (25gmai/ha)	17.31	13.76	20.50	18.23	13.85	24.02	22.26	0.1(1.81)	0.1(1.81)	0.1
T4	Buprofezin 25 SC	Chition synthesis inhibitor	1.5 ml/ lit (125gmai/ha)	17.46	20.96	+20.04	18.55	23.12	+18.50	+19.27	0.1(1.81)	0.1(1.81)	0.1
T5	Denotifuran 20 SG	Neonicotinoid	0.4 gm/ lit	17.92	13.96	22.09	15.35	8.53	44.46	33.36	0.1(1.81)	0.1(1.81)	0.1
T6	Glamour 80 wg (Ethiprole40wg + Imidacloprid40wg)	Phenyl pyrazale +neo nicotinoid	0.25 gm/lit	16.91	11.87	29.80	18.12	7.67	57.67	43.73	0.1(1.81)	0.1(1.81)	0.1
SEM (±)				2.031	1.501		1.727	2.783					
CD (P=0.05)				5.93	4.45		5.07	8.12					

*Each figure is the mean of 3 applications.

Buprofezin as well as some of the tested chemical application. However, more frequent application of pesticides i.e. 6-8 times after completion of weeding leads to increasing cost of production, thus minimizing profit. That is the reason of obtaining lower cost benefit ratio in farmers practice in both the years of study.

The lowest cost benefit ratio was obtained from farmer's practice where as highest cost benefit ratio was recorded from plots treated with buprofezin during both the years of study. Likewise highest control of BPH was also recorded from buprofezin applied plots followed by acephate treated plots. The local shop keepers are acting as principal source of advice of plant protection recommendation as assessed from survey. Imidacloprid as well as glamour application could not recorded satisfactory yield might be due to development of resistance in this pest towards these insecticide because of more use of that chemicals throughout the crop growth period in the irrigated command area (KRISHNAIAH *et al.,* 2006). Buprofezin has recorded significant control because it belongs to chitin synthesis inhibiter group with promising action against homopteran sucking pest (GOUR and SRIDEVI, 2012). Efficacy of both acephate and Buprofezin in controlling this pest has been reported earlier by several workers. (HEGDE and JAYAPRAKASH, 2009).

The predatory mirid bug population recorded at 7 days after spray of both the years of experimentation indicated significant variation among the treatments. Significantly higher mirid bug population was recorded in buprofezin treatments recorded after 7DAT and plots receiving farmers prioritized treatments recorded 61.73%reduction in mirid population (Table-2). HEINRICHS (1984) reported that buprofezin is safe to predators of plant hoppers including *C. lividipennis*. KOICHI *et al*. (2000) observed that *C. lividipennis* decreased to low level in many insecticide treated plots except those treated with buprofezin. He further stated that phenthoate, imidacloprid and deltamethrin were found toxic to *C*. *lividipennis*. The plots receiving farmers practice only recorded hopper burn of 2.45 and 2.95% during first and second year of experiment, respectively.

Hence, it can be concluded from this study that in heavy insecticide and crop input used areas of the state new insecticides like Buprofezin and in traditional areas without irrigation facility, acephate can be safely used for controlling BPH and WBPH population infesting paddy crop.

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