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Evaluation of insecticides against rice hispa, *Dicladispa armigera* Oliver (Coleoptera : Chrysomelidae)

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ABSTRACT

Rice hispa, Dicladispa armigera Olivier is emerging as a serious insect pest of paddy in rice growing regions of eastern India and damage by this pest has been observed 7-14 days after transplantation during wet season at Central Rice Research Institute, Cuttack. The damage symptoms by grub was more prominent towards 2nd week of August followed by increased infestation by adults towards 3rd and 4th week. Nine insecticides were tested against the pest out of which clothianidin, bifenthion, profenphos, thiomethoxam, imidacloprid and chlorantraniliprole were found effective against adult hispa. But only bifenthion, clothianidin, profenphos and thiomethoxam could reduce the the grub damage. However, clothianidin and bifenthion were most effective in controlling the adult as well as grub damage with their immediate knock-down effect and persistent toxicity.

Key words : *rice, hispa, insecticides, evaluation, clothianidin, bifenthion*

Rice hispa , *Dicladispa armigera* Oliver was known to be a sporadic pest of paddy in the states like Andhra Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Manipur, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal. But in recent years, it has assumed the major pest status in Assam, Bihar, Uttar Pradesh, Himachal Pradesh and Odisha (DRR, 2009; CRRI, 2009) causing considerable economic loss to the farmers. The insect, which was a pest of rare occurrence during wet season in Odisha caused in severe damage in Dhenkanal district from the year 2005 onwards (Dani and Jena, 2007). During 2006, the insect infested the rice fields of Central Rice Research Institute farm and it was severe in scented rice plots (Jena *et al*, 2009). Later, the insect was observed to be a serious pest of wet-season rice in different districts of Odisha, particularly in rainfed lowland areas. Adult insects remained at the surface of rice leaves, scrapping it from above so that the lower whitish epidermal layers were left. The grubs also joined with adult, but by mining inside the leaf and scrapping the chlorophyll thereby forming continuous white patches of epidermis. The yield loss was repoted to be about 36% under insect pressure of 4 adults per hill. Hence, there isalways a necessity to evaluate insecticides against hispa to find out more effective products for the successful control of this pest.

Therefore, trials were undertaken to evaluate some new and also commonly available insecticides for their efficacy against rice hispa in green house as well as in field conditions of CRRI, Cuttack during the wet seasons of 2006 - 2009 .

MATERIALS AND METHODS

Field experiments were conducted with scented rice Ketkijoha during wet seasons of 2006 and 2007. Thirty day old seedlings were transplanted during 4th week of July in complete randomized block design for 10 treatments including untreated control and replicated four times. Fertilizer was applied @ 60N : 30K : 30P in 3 split. Half the dose of N and K and full dose of P was applied as basal application at the time of transplanting. Other half of N was applied in 2 equal splits, one at the tillering stage and another at the panicle initiation stage. Monitoring for hispa incidence continued from August 1st week onwards. Nine insecticides (Table 1) were applied as separate treatments when pest population was 1-2 adult hill^{-1} or at the infestation level of 1-2

infested leaves hill^{-1}. Observations were taken on insects hill^{-1} at 1, 5 and 10 days after treatment (DAT) and the percentage of leaf damage hill^{-1} at 10 DAT. Each observation included 30 hills at random from each replication of different treatments including untreated control.The data thus recorded were subjected to statistical analysis and the efficacy of insecticides was confirmed.

stabilization. One set of experimental plants were infested with insects from maintainance cage @ 10 pairs of male and females pot^{-1} and were kept inside fine wiremesh cages. They were allowed to oviposit on the plant for 2 days after which plants were cleaned of insects. After the grubs developed from eggs and started feeding, insecticides were applied against them as foliar spray (Table 2). The rate of leaf damage was

Table 1. Field efficacy of insecticides against rice hispa, *Dicladispa armigera* Oliver

Treatments	Dose g a.i. ha^{-1}	Adult hispa hill^{-1} at different DAT			% Leaf damage at 10 Days			ORE
		1D	5D	10D	Adult	Grub	Total	
Thiomethoxam	100	1.5	1	3 ab	0.33(0.895)	3.2(1.9)	3.53	3
Imidacloprid	100	3.4	2	5 c	0.13(0.786)	3.8(2.1)	3.93	5
Bifenthion	30	1.1	1.8	2 a	0.10(0.789)	0.18(0.8)	0.19	1
Indoxacarb	30	2.6	2	6 c	0.48(0.981)	3.3(1.9)	3.78	4
Monocrotophos	500	3.5	4.3	8 d	0.60(1.043)	8.3(3.0)	8.9	8
Chlorpyrifos	500	4.8	6.8	10 d	0.63(1.055)	9.8(3.2)	10.43	9
Clothianidin	10	3.9	1	1 a	0.10(0.771)	3.4(2.0)	3.50	2
Chlorantraniliprole	100	8.2	7	9 d	0.75(1.129)	7.98(2.9)	8.68	7
Profenphos	100	1.8	3	3 bc	0.28(0.876)	5.53(2.5)	5.81	6
Untreated control	-	18.3	15.3	14 e	9.70(3.186)	15.08(3.94)	24.78	
LSD at 5%		1.7	2.0	2.1	0.17	0.36	-	-

DAT - Days after transplanting, ORE - Order of relative efficacy, values in parentheses are arc sine transformed values
Mean followed by a common letter in a column are not significantly different at the 5% level.

Green house trials were conducted during 2008 and 2009 to evaluate the efficacy of insecticides in controlled condition. Thirty day old seedlings were transplanted in earthen pots (9" diameter) and were allowed to grow healthy under recommended agronomic practices. Two sets of plants were grown separately in complete randomized design (CRD). Adult male and female hispa were collected from the infested fields of CRRI farm and released in a maintainance cage for

recorded at different DAT to assess the efficacy of insecticides. Insecticides were applied as foliar spray to run down condition and they were allowed to dry for 2 hours. Adult hispa were released on the plants @ 25 pot^{-1}. Mortality and rate of leaf feeding of the insects was recorded after 24 hours of release. This was repeated at each 2-3 days intervals till no more mortality or feeding was observed. The data thus recorded were subjected to analysis for pesticide toxicity index

Table 2. Persistent toxicity of insecticides against adult hispa *Dicladispa armigera* Oliver

Treatments	% mortality of rice hispa after different DAT						P	T	PT	ORE
	1	2	4	6	8	10				
Imidacloprid	100	84	60	43	21	-	8	67.6	540.8	5
Clothianidin	100	100	100	100	80	55.0	10	107	1070	1
Clorantraniliprol	100	100	53.3	56.3	20.0	_-	8	65.92	527.36	6
Profenphos	100	100	92.2	80.0	43.3	-	8	83.1	664.8	3
Bifenthrin	100	100	100	100	80.0	56.7	10	89.4	894	2
Clorpyriphos	100	90	50.0	26.7	-	-	6	66.67	400.02	8
Monocrotophos	100	100	55	33	-	-	6	72	432	7
Thiomethoxam	100	100	90	73.3	46.7	-	8	82	656	4

DAT - Days after transplanting, PT - PT index, ORE - Order of relative efficacy

(Pradhan, 1967) after correcting the untreated control mortality of the insects by applying Abbot's formula (Abbot, 1925) and the order of efficacy for different insecticides was worked out (Table 3).

RESULTS AND DISCUSSION:

Observations on pest status showed that adult hispa made it's appearance during August 1st week of 2006 which was followed by the extensive leaf damage by grubs during 2nd week. The grubs usually mined the leaf and fed from inside causing a continuous feeding which turned the leaf white in patches from tip to downwards. Adults again appeared in large numbers towards 3rd week and onwards and fed on the chlorophyll of the leaves causing parallel white stripes. The damage symptoms were severe, i.e., on an average about 50% leaf damage per hill or more, in more than 50% hills in untreated control plots with about 15 adult insects per hill. This severity continued from 3rd week of August to 3rd week of September after which it gradually decreased to 1-2 insects per hill towards last week of September.

Observations on insecticide treatment revealed that almost all the insecticides were capable of reducing the population of adult hispa after 1 day of the treatment (1 DAT). Though the population gradually increased towards 10 DAT, but still it was significantly less than the untreated control in all the treatments. However, the insecticides like clothianidin, bifenthion, indoxacarb, thiomethoxam were more effective than the rest of the insecticides tested as the rate of feeding was drastically reduced in the case of adults in all the treatments. But damage by grubs was still continuing in all the treatments except bifenthion where it was as low as 0.18 cm^2.The data indicated the low efficacy of most of the insecticides against grub stage (Table 1).

Green house experiment showed that all the insecticides could kill 100% of the adult insects within 24 hours of the treatment. Clothianidin and bifenthion were most effective, retaining their persistent toxicity upto 10 DAT. Insecticides like profenphos and thiomethoxam were next in the order of effectiveness followed by imidacloprid, chlorantraniliprole, monocrotophos and chlorpyrifos (Table 2). But grubs which were developed inside the leaf blade, did not respond to insecticide treatments as good as adults. Only bifenthion and clothianidin could reduce the rate of damage which were within 0.23 and 0.17 cm^2 area respectively. Profenphos and thiomethoxam were next in the order to reduce feeding significantly in comparison to untreated control (Table 3).

Table 3. Rate of leaf area feeding by grubs of rice hispa at different days after transplanting

Treatments	Grub damage (cm^2) 1 DAT	Grub damage (cm^2) 5 DAT	Grub damage (cm^2) 10 DAT
Thiomethoxam	0.2	0.7	4.0
Imidacloprid	0.3	0.63	4.1
Bifenthrin	0.2	0.23	0.37
Indoxacarb	0.3	0.73	4.47
Monocrotophos	0.2	0.73	5.27
Chlorpyriphos	0.2	0.73	5.63
Chlothianidin	0.2	0.17	0.47
Chlorantraniliprile	0.3	0.6	5.57
Profenphos	0.2	0.4	3.4
Control	0.3	1.97	8.1

DAT - Days after transplanting

Based on the above results, it isclear that keen observation is necessary from the 1st week of August to monitor the adult hispa activity so that any of the insecticides can be applied to protect the crop. But however, if grub damage starts along with adult insect activity, more effective and persistent insecticides like clothianidin and bifenthion should be applied for better protection.

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