BIO-EFFICACY OF INSECTICIDE FORMULATIONS AGAINST TWO LEPIDOPTEROUS INSECTS OF RICE

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Abstract: Extent of suppression of yellow stem borer *Scirpophaga incertulas* and leaf folder *Cnaphalocrocis medinalis* infestation on rice crop by six insecticides formulations was studied in the field conditions of rice variety swarna during two consecutive Kharif seasons of 2013 and 2014. Experiment was done following complete randomized block design and had three replications for each year. All treatments were significantly effective in checking stem borer infestation causing the decrease of both percent dead heart and folded leaves Numerically least damage was recorded for profenophos + cypermethrin 44% @ 1000 ml/ha. during first and second spray for both 7 and 15 days after spraying as 3.83,4.50,7.16 and 7.84 percentage of dead heart/10 hills,respectively.In case of leaf folder during first and second spray for both 7 and 15 days after spraying the percentage folded leaves/10 hills noticed as 0.65,1.08,1.86 and 2.35 respectively with maximum yield of 49.64 q/ha.

Keywords: *Scirpophaga incertulas,Cnaphalocrocis medinalis* , Insecticide formulations

INTRODUCTION

Rice is the most important food crop that has been improved since its domestication about 8000 years ago. It is the staple food of half of the world's population. India leads the world in rice area with 41.85 m ha with a production of 102 m tonnes, but productivity is only 75 % of the world average of 4.02 tonnes ha (Anonymous, 2012).Though insect pests have been regarded as an important constrain in paddy cultivation through the centuries, occurrence of pest outbreaks have increased with the change of pest complexities, in the last four decades (Ahmed et al., 2010). Paddy leaf folder is one of the most important insect pests in Indian subcontinent (Gunathilangaraj et al., 1986). Out of the eight species of leaf folder, the most widespread and important one is *Cnaphalocrocis medinalis* (Guenee) (Bhatti et al., 1995). Feeding of *Cnaphalocrocis medinalis* often results in stunting, curling or yellowing of plant green foliage (Alvi et al., 2003)

The yellow stem borer *Scirpophaga incertulas* is the worst pest which can cause severe damage and yield loss to the rice crop in the later stage. In India, the losses incurred by different insect pests are reported to the tune of 55.12 million rupees which in turn workout to 18.16 per cent of total losses. Out of this, 20 to 30 per cent damage is alone done by yellow stem borer, *Scirpophaga incertulas* (Walker) (Lal, 1996). The yellow stem borer *Scirpophaga incertulas* (Walker) has assumed the number one pest status and attacks the rice crop at all stages of its growth (Pasulu et al., 2002.). It causes dead hearts at active tillering stage and can lead to complete failure of the crop (Karthikeyan and Purushothaman, 2000). Among the various strategies adopted to combat the pest of rice, insecticides are the first line of defense.

MATERIAL AND METHOD

A field experiment was conducted during Kharif 2013 and 2014. The experiment was laid out in a randomized block design with nine treatments and three replications. The variety swarna was sown during the month of July in respective seasons. Seedlings were transplanted 30 days after sowing with spacing of 20 x 15 cm. All the agronomic practices were followed as per the recommended package of practices. The knapsack sprayer and spray volume @ 500 l/ha was used with hollow cone nozzle to impose the spray treatments. Following treatments were imposed twice in a season, one at vegetative and second one at reproductive phase of the crop. The Per cent dead heart and Per cent folded leaves were recorded by following standard method for stem borer and leaf folder (Anon., 2007)

Per cent dead heart

$$= \frac{\text{Number of plants with dead heart}}{\text{Total number of plants}} \times 100$$

Per cent leaf damage

$$= \frac{\text{Number of damaged leaves}}{\text{Total number of leaves}} \times 100$$

The observations on stem borer and leaf folder were recorded on 10 hills selected randomly and averaged to per hill basis. Observation of freshly damaged or folded leaves/hill just before spray and at interval 7 and 15 days after spray for leaf folder, whereas percentage dead heart/hill just before spray and at interval 7 and 15 days after spray for stem borer. Yield data was recorded in quintals/ha.

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The detail of insecticidal treatments is given as under;

S.No.	Treatment	Dose /ha (g or ml)
1.	Profenophos + cypermethrin 44 EC	500
2.	Profenophos + cypermethrin 44 EC	750
3.	Profenophos + cypermethrin 44 EC	1000
5.	Profenofos 50 EC	1000
6.	Cypermethrin 10EC	500
7.	Acephate 75 SP	1000
8.	Lambda Cyhalothrin 5 EC	250
9.	Control	-

RESULT AND DISCUSSION

All insecticidal treatments were found effective over control for leaf folder (*Cnaphalocrosis medinalis*). In 2013-14, among all Profenophos + cypermethrin 44% @ 1000 ml/ ha was found most effective during 1st& 2nd sprays for both 7 & 15 days after spraying as 0.65, 1.08, 1.86 and 2.35 percentage of folded leaves/ 10 hills, respectively. Which was at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 0.70, 1.24, 2.09 and 2.64 percentage of folded leaves/ 10 hills, respectively. Similarly, in 2014-15, among all Profenophos + cypermethrin 44% @ 1000 ml/ ha was found most effective during 1st& 2nd sprays for both 7 & 15 days after spraying as 1.44, 1.68, 2.78 and 2.98 percentage of folded leaves/ 10 hills, respectively. Which was at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 1.52, 1.81, 2.94 and 3.10percentage of folded leaves/ 10 hills, respectively.

All the insecticidal treatments were found effective over control for stem borer (*Scirpophaga incertulas*).In 2013-14, among all Profenophos + cypermethrin 44% @ 1000 ml/ ha was found most effective during 1st& 2nd sprays for both 7 & 15 days after spraying as 3.83, 4.50, 7.16 and 7.84 percentage of dead heart/10 hills, respectively. Which was at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 4.02, 4.79, 7.37 and 8.13percentage of dead heart/ 10 hills. Similarly, in 2014-15,among all Profenophos + cypermethrin 44% @ 1000 ml/ ha was found most effective during 1st& 2nd sprays for both 7 & 15 days after spraying as 6.34, 6.78, 8.44 and 8.60 percentage of dead heart/ 10 hills, respectively. Which was at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 6.51, 6.88, 8.60 and 8.71percentage of dead heart/ 10 hills, respectively.

The data present in table 5 reflect that the rice yield was also significantly influenced by insecticidal treatments. In 2013-14, among all treatment , maximum yield was found in Profenophos + cypermethrin 44% @ 1000 ml/ ha treated plot as 49.64 q/ha, which at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 45.12 q/ha. Similarly, in 2014-15,among all treatment , maximum yield was found in Profenophos + cypermethrin 44% @ 1000 ml/ ha treated plot as 51.74 q/ha, which at par with Profenophos + cypermethrin 44% @ 750 ml/ ha as 48.61 q/ha.

No specific observation on the impact of insecticide formulations on incidence in relation to local paddy cultivars was carried out earlier in the Raipur,Chhatisgarh.Saroja and Raju (1982) have viewed that cypermethrin and fanvalerate are best suitable pesticide to suppress leaf folder population and accordingly to maximize paddy yield. Bhanu et al. (2008) have noted considerable variations of the efficacy on pesticides in field condition. Wakil et al. (2001) from Pakistan have reported that not all the pesticides were equally effective to check leaf folder attack. Mishra *et al.* (1998) and Kushwaha (1995) who have noted that the population suppression capacity of monocrotophos and cypermethrin was essentially prudent in some regions of India.

CONCLUSION

On the basis of above results, Profenophos + cypermethrin 44% @ 1000 ml dose/ha (formulation) was found to be the effective in controlling stem borer (*Scirpophagaincertulas*) and leaf folder (*Cnaphalocrosismedinalis*).

Table 1. Effect of insecticides on rice leaf-folder during kharif 2013-14.

S. No.	Treatment	Dose /ha (g or ml)	Percentage of folded leaves / 10 hills						Average percentage of folded leaves/ 10 hill after spray
			Pre treatment	1st Spray		Pre treatment	2nd Spray		
				7 DAS	15DAS		7 DAS	15DAS	
1.	Profenophos + cypermethrin 44 EC	500	0.72 (3.91)	1.33 (6.53)	2.38 (8.87)	2.00 (8.05)	2.47 (9.03)	3.36 (10.54)	2.39
2.	Profenophos + cypermethrin 44 EC	750	0.53 (3.90)	0.70 (4.78)	1.24 (6.39)	1.66 (7.37)	2.09 (8.31)	2.64 (9.31)	1.67
3.	Profenophos + cypermethrin 44 EC	1000	0.63 (4.56)	0.65 (4.62)	1.08 (5.89)	2.01 (8.00)	1.86 (7.82)	2.35 (8.79)	1.40

4.	Profenofos 50 EC	1000	0.55 (3.43)	1.20 (6.27)	1.82 (7.74)	2.00 (8.05)	2.79 (9.59)	3.72 (11.11)	2.38
5.	Cypermethrin10EC	500	0.86 (4.33)	1.03 (5.78)	2.13 (8.39)	1.67 (7.29)	2.81 (9.62)	3.47 (10.73)	2.36
6.	Acephate 75 SP	1000	0.85 (4.30)	1.36 (6.66)	2.47 (9.03)	2.00 (8.05)	2.92 (9.84)	3.14 (10.17)	2.47
7.	Lambda Cyhalothrin 5 EC	250	0.81 (4.21)	0.98 (5.63)	1.49 (7.00)	2.03 (8.18)	2.38 (8.87)	2.97 (9.95)	1.96
8.	Control	-	0.72 (3.96)	1.79 (7.68)	2.82 (9.66)	2.05 (8.14)	3.54 (10.81)	4.36 (12.03)	3.13
CD 5%			**NS**	**0.80**	**1.10**	**NS**	**0.97**	**1.12**	

Figures in Parenthesis are Angular Transformed Values

Table 2. Effect of insecticides on rice leaf-folder during kharif 2014-15.

S. No.	Treatment	Dose/ha (g or ml)	Percentage of folded leaves / 10 hills						Average percentage of folded leaves/10 hill after spray
			Pre treatment	1st Spray		Pre treatment	2nd Spray		
				7DAS	15DAS		7DAS	15 DAS	
1.	Profenophos + cypermethrin 44 EC	500	1.44 (6.88)	1.96 (8.04)	2.50 (9.09)	2.94 (9.86)	3.44 (10.64)	3.72 (11.15)	2.91
2.	Profenophos + cypermethrin 44 EC	750	1.36 (6.69)	1.52 (7.07)	1.81 (7.72)	2.74 (9.52)	2.94 (9.86)	3.10 (10.16)	2.34
3.	Profenophos + cypermethrin 44 EC	1000	1.40 (6.79)	1.44 (6.88)	1.68 (7.44)	2.64 (9.34)	2.78 (9.59)	2.98 (9.93)	2.22
4.	Profenofos 50 EC	1000	1.11 (6.04)	1.86 (7.84)	2.36 (8.83)	2.84 (9.69)	3.33 (10.50)	3.58 (10.90)	2.78
5.	Cypermethrin 10EC	500	1.31 (6.56)	1.91 (7.93)	2.44 (8.98)	2.91 (9.81)	3.41 (10.63)	3.64 (10.99)	2.85
6.	Acephate 75 SP	1000	1.26 (6.43)	2.03 (8.18)	2.66 (9.38)	2.68 (9.41)	3.56 (10.87)	3.72 (11.11)	2.99
7.	LambdaCyhalothrin 5 EC	250	1.31 (6.56)	1.72 (7.53)	1.96 (8.04)	2.88 (9.76)	3.16 (10.23)	3.24 (10.36)	2.52
8.	Control	-	1.18 (6.23)	3.11 (10.12)	3.48 (10.74)	3.18 (10.27)	3.96 (11.47)	6.14 (14.34)	4.17
CD 5%			**NS**	**0.43**	**0.51**	**NS**	**0.47**	**0.32**	

Figures in Parenthesis are Angular Transformed Values

Table 3. Effect of insecticides on rice stem borer during kharif 2013-14.

S. No.	Treatment	Dose /ha (g or ml)	Percentage of dead heart / 10 hills						Average percentage of dead heart/10 hill after spray
			Pre treatment	1st Spray		Pre treatment	2nd Spray		
				7 DAS	15DAS		7 DAS	15 DAS	
1.	Profenophos + cypermethrin 44 EC	500	4.11 (11.68)	4.68 (12.48)	5.49 (13.54)	8.06 (16.47)	8.40 (16.83)	9.25 (17.69)	6.95
2.	Profenophos + cypermethrin 44 EC	750	3.83 (11.27)	4.02 (11.55)	4.79 (12.62)	7.95 (16.35)	7.37 (15.73)	8.13 (16.56)	6.08
3.	Profenophos + cypermethrin 44 EC	1000	4.15 (11.72)	3.83 (11.26)	4.50 (12.23)	7.73 (16.13)	7.16 (15.50)	7.84 (16.24)	5.83
4.	Profenofos 50 EC	1000	4.18 (11.74)	4.48 (12.20)	5.46 (13.50)	8.28 (16.71)	8.14 (16.56)	8.81 (17.24)	6.72
5.	Cypermethrin 10EC	500	3.59 (10.89)	4.59 (12.36)	5.71 (13.81)	8.46 (16.90)	8.36 (16.79)	9.03 (17.46)	6.92
6.	Acephate 75 SP	1000	3.45 (10.69)	4.89 (12.76)	6.19 (14.39)	8.22 (16.64)	9.49 (17.93)	11.15 (19.50)	7.93
7.	Lambda Cyhalothrin 5 EC	250	4.00 (11.52)	4.36 (12.14)	4.97 (12.83)	8.12 (16.54)	7.96 (16.37)	8.81 (17.24)	6.52
8.	Control	-	3.78 (11.18)	6.29 (14.51)	8.36 (16.79)	8.85 (17.29)	13.12 (21.22)	17.12 (24.42)	11.22
CD 5%			**NS**	**0.84**	**1.13**	**NS**	**0.83**	**0.94**	

Figures in Parenthesis are Angular Transformed Values

Table 4. Effect of insecticides on rice stem borer during kharif 2014-15.

S. No.	Treatment	Dose /ha (g or ml)	Percentage of dead heart / 10 hills						Average percentage of dead heart/10 hill after spray
			Pre treatment	1st Spray		Pre treatment	2nd Spray		
					15 DAS		7 DAS	15 DAS	
1.	Profenophos + cypermethrin 44 EC	500	5.88 (14.02)	7.33 (15.70)	7.84 (16.25)	8.38 (16.82)	9.34 (17.78)	9.44 (17.88)	8.49
2.	Profenophos + cypermethrin 44 EC	750	6.18 (14.38)	6.51 (14.77)	6.88 (15.20)	8.47 (16.91)	8.60 (17.04)	8.71 (17.49)	7.68
3.	Profenophos + cypermethrin 44 EC	1000	6.24 (14.46)	6.34 (14.57)	6.78 (15.08)	8.34 (16.77)	8.44 (16.88)	8.60 (17.04)	7.54
4.	Profenofos 50 EC	1000	5.71 (13.81)	7.14 (15.49)	7.36 (15.73)	8.88 (17.33)	9.14 (17.59)	9.26 (17.70)	8.23
5.	Cypermethrin 10EC	500	5.94 (14.10)	7.24 (15.52)	7.44 (15.82)	8.67 (17.11)	9.26 (17.70)	9.38 (17.82)	8.33
6.	Acephate 75 SP	1000	6.10 (14.29)	7.38 (15.75)	7.54 (15.93)	8.79 (17.23)	9.34 (17.78)	9.50 (17.94)	8.44
7.	LambdaCyhalothrin 5 EC	250	5.78 (13.90)	6.94 (15.26)	7.21 (15.56)	8.68 (17.12)	8.94 (17.39)	9.18 (17.63)	8.07
8.	Control	-	5.68 (13.78)	8.94 (17.39)	9.25 (17.69)	9.34 (17.78)	14.74 (22.56)	18.84 (25.71)	12.94
CD 5%			**NS**	**0.46**	**0.38**	**NS**	**0.42**	**0.56**	

Table 5. Effect of insecticides on yield during kharif 2013-14 and 2014-15.

S. No.	Treatment	Dose /ha (g or ml)	Yield q/ha (2013-14)	Yield q/ha (2014-15)
1.	Profenophos + cypermethrin 44 EC	500	37.43	36.87
2.	Profenophos + cypermethrin 44 EC	750	45.12	48.61
3.	Profenophos + cypermethrin 44 EC	1000	49.64	51.74
4.	Profenofos 50 EC	1000	39.33	40.45
5.	Cypermethrin 10EC	500	36.56	38.67
6.	Acephate 75 SP	1000	33.45	34.88
7.	LambdaCyhalothrin 5 EC	250	41.11	43.33
8.	Control	-	24.65	25.12
CD 5%			**7.98**	**7.46**

REFERENCES

Alvi, S.M., Ali, M.A., Chaudhary, S. and Iqbal, S. (2003). Population trends and chemical control of rice leaf folder, Cnaphalocrocis medinalis on rice crop. Inter. J. Agric. Biol. 5: 615–617.

Anonymous, (2007). Annu. Rep., Dir. Rice Res., Hyderabad, p.2.59-2.60

Anonymous: (2012). Annual report 2010-11, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, p. 31

Bhatti, M.N. (1995). Rice leaf folder (*Cnaphalocrosis medinalis*): A review. Pak. Entomol. 17: 126– 131.

Gunathilagaraj, K. and M.Gopalan, (1986). Rice Leaf folder Complex in Madurai, TN, India. Intl. Rice Res. Notes 11(6): 24.

Karthikeyan, K. and Purushothaman, S. M. (2000). Efficacy of carbosulfan against rice yellow stem borer, Scirpophaga incertulas Walker (Pyralidae, Lepidoptera) in rabbi rice, Indian J. Pl. Prot. 28(2): 212-214.

Lal, O. P. (1996). Recent advances in Entomology (Ed). Lal, O.P. APC publication pvt. Ltd. N. Delhi. p. 392.

Mishra, B.K., P. R. Mishra and S. M. A. Mandal, (1998). Screening of rice cultivars for resistance to leaf folder. Indian J. Entomol., 64(1):68-72.

Pasulu, I. C., Krishnaiah, N. V., Kotti, G. and Varma, N. R. G. (2002). IPM in rice mitr. pp. 45-55.

Saroja, R. and N. Raju, (1982). An effect of foliar insecticides on rice stem borers and leaf folders. Intl. Rice Res. News 7:14.

Wakil, W.; Hussain, M.; Akbar, R. and Gulzar, A. (2001). Evaluation of different insecticides against rice stem borer and rice leaf folder. Pak. J.Agric. Sci. 38: 49–50