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Assessing the Effectiveness of Newer Insecticides against Rice Leaf Folder, *Cnaphalocrocis medinalis* (Crambidae: Lepidoptera)

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ABSTRACT: Leaf folder is one of the major pests of rice which is presently controlled by many insecticides. The present investigation was aimed to study the efficacy of newer insecticides against rice leaf folder. The lowest leaf damage was observed in Emamectin benzoate 5 SG which recorded 1.3% damage, followed by Acephate 50% + Imidacloprid 1.8% SP, Flubendiamide 480SC, thiacloprid 240SC, Spinosad 45SC, Acephate 75SP, Chlorpyriphos 50% + Cypermethrin 5% EC and Fipronil 5SC. After second spray, Emamectin benzoate 5 SG recorded lowest leaf damage (3.85%), which was in line with the Acephate 50% + Imidacloprid 1.8% SP, Acephate75SP, Spinosad 45 SC, Flubendiamide 480SC, Thiacloprid 240SC, Chlorpyriphos 50% + Cypermethrin 5%EC and Fipronil 5SC. While untreated check recorded highest damage as there was no intervention with the insecticide spray.

Keywords: Leaf folder, efficacy, spray, leaf damage, Novel insecticides.

INTRODUCTION

Rice (*Oryza sativa* L.) is one of themajor cereal crops in the world and it forms the daily food for more than 65% of the total population in India. Rice can be cultivated practically anywhere, from steep hill to the mountain regions by utilization of water- in a controlled terrace systems. The cropping intensity (C.I) nearly 153.1%. The U.P. ranks second in the production of rice (Gadal *et al*., 2019). Rice is grown in all the districts of U.P. Rice is usually grown in *Kharif* season in around 5.87 million hectares its succeded by the zaid season with 36000-39000 ha. The bororice is grown only in deeply flooded areas nearly of 3000 ha mainly in oriental districts of the U.P. One of the important problem of rice farming in India is the incursion of insect pests at different growth stages of the crop. In India, nearly the 220 species of the different insect pests which feed on the crop rice (Arora and Dhaliwal 1996). The major pests which feed on rice is leaf folder *Cnaphalocrocis medinalis (Guenee*). It has become increasingly important with the spread of high-yielding rice varieties and the accompanying changes in cultural practices. Outbreaks of serious RLF infestations have been reported in many Asian countries including India, Korea, Japan, China, Malaysia, Sri Lanka and Vietnam (Bautista *et al.*, 1984; Khan *et al*., 1989; Heong, 1993; Dale, 1994; Riley *et al*., 1995; Khan *et al.*, 1996). Bautista *et al.* (1984) have shown that losses due to RLF are positively related to the percentage of damaged leaves. About 50% of the Indian paddy growing farmers, they use insecticides nearly one to six sprays per crop season against paddy yellow stem borers, paddy brown plant hopper, white backed plant hopper and rice leaf folder (Shepard, 1989). Knowledge of insect-pests population dynamics is essential for developing sustainable crop protection strategies. Hence, based on the pest population level, the different insecticides are sprayed in order to reduce the infestation level. Newer insecticides play a major role in reducing the pest population level very rapidly as compared to other insecticides. The present investigation was aimed to assess the efficacy of newer insecticide molecules against paddy leaf folder.

MATERIAL AND METHODS

The present investigation was conducted for the study the efficacy of newer insecticides against rice leaf folder. The data recorded one day before spraying as pre-treatment data and the post-treatment data recorded at 1st, 3rd, 7th and 10th day after spraying on variety HUR105 (Malviya sugandith dhan105) of rice at Agricultural Research Farm, Institute of Agricultural Sciences, BHU, Varanasi. Total experimental plot size measured 3m×3m. For field experiment, randomized block design (RBD) was carried with 3 replications and

10 treatments which consist of untreated control also during *Kharif* 2018 in order to estimate the bio-efficacy of newer insecticides against the rice leaf folder. All the agronomic practices were followed during crop growth period.

The treatments details were as follows:

T1- Thiacloprid 240SC
T2- Fipronil 5SC
T3- Chlorfenapyr 2 SC
T4-Flubendiamide 480 SC
T5-Spinosad 45 SC
T6- Emamectin benzoate **5** SG
T7-Chlorpyriphos50% +cypermethrin5% EC
T8- Acephate50%+imidacloprid1.8% SP
T9- Acephate 75% SP
T10-Untreated control

For rice leaf folder infestation study 10 hills in each plot was selected at randomly and the number of infested leaves or leaves per hill at 1st, 3rd, 7th and 10th day after spraying was recorded.

Statistical Analysis. The Mean value of data obtained from field experiments were analysed statistically by ANOVA using the package SPSS after converting it to Angular transformed values

RESULTS AND DISCUSSION

The insecticides are evaluated for their bio-efficacy against % leaf damage by the leaf folder, after first (40 DAT) and second spray (55DAT) the observations are taken at 1, 3, 7, 10 DAS, the lowest leaf damage was observed in Emamectin benzoate 5 SG which recorded 1.3% damage, followed by Acephate 50% + Imidachloprid 1.8% SP, Flubendiamide 480SC, thiacloprid 240SC, Spinosad 45SC, Acephate 75SP, Chlorpyriphos 50% + Cypermethrin 5% EC and Fipronil 5SC. However, untreated check recorded highest leaf damage. Second spray was taken 15days after first spray and the overall average % leaf damage per 10 hills caused by rice leaf folder after first insecticidal spray was, Emamectin benzoate 5 SG recorded lowest leaf damage (3.85%), which was at par with Acephate 50% + Imidacloprid 1.8% SP, Acephate 75SP, Spinosad 45 SC, Flubendiamide 480SC, Thiacloprid 240SC, Chlorpyriphos 50% + Cypermethrin 5% EC, Fipronil 5SC. Untreated check recorded highest damage.

The results were closer to Masanori *et al.*, (2005) who suggested that the effectiveness of emamectin benzoate 5 SG @ 0.25 g/l against many lepidopterous insect pests found to be effective. Zheng *et al.* (2011) reported that rice leaf folder was most susceptible to antibiotic insecticides emamectin benzoate 5 SC @ 0.25 g/l, and spinosad 45 @ 0.2 ml/l. Sekh *et al.* (2007) reported that the efficiency of flubendiamide 480 SC @ 24 and 30 g *a.i.*/ha and spinosad 45 SC @ 54 g *a.i.*/ha against rice leaf folder. The efficacy of flubendiamide 480 SC @0.2 ml/l against leaf folder shows higher efficacy than spinosad 45 SC @ 0.2 ml/l. Sarao and Mahal (2008) recorded that cartap hydrochloride 4 G @ 1.0 kg *a.i.*/ha followed by monocrotophos 36 SL @ 0.50 kg *a.i.*/ha and chlorpyriphos 20 EC @ 0.50 kg *a.i.*/ha showed to be the most effective in decreasing the leaf folder damage. Singh *et al.* (1999) recorded that profenophos 50 EC and chlorpyriphos 20 EC @ 500 g *a.i.*/ha were effective treatments in decreasing the leaf folder damage and increased grain yield over untreated treatments by 32.3 and 46.9 % respectively.

Table 1: Effect of insecticidal treatments against rice leaf folder after 1st insecticidal spray.

Sr. No.	Treatments	Dosage *a.i*/l	Per cent leaf damage per 10 hills at different days after 1st insecticidal spray					Post treatment mean
			1 DBS	1 DAS	3 DAS	7 DAS	10 DAS	
1.	Thiacloprid 240 SC	0.25 g/l	1.23* (5.97) **	1.7 (7.5)	1.44 (6.84)	2.49 (9.06)	2.70 (9.26)	2.10
2.	Fipronil 5 SC	2.00 g/l	3.14 (9.97)	2.70 (9.29)	2.36 (8.79)	4.04 (11.59)	8.35 (14.19)	4.36
3.	Chlorfenapyr 2 SC	2.00 g/l	1.58 (7.20)	1.77 (7.61)	0.90 (5.22)	2.43 (8.94)	2.43 (8.81)	1.88
4.	Flubendiamide 480 SC	0.10 g/l	0.37 (2.01)	1.63 (7.25)	0.86 (5.22)	1.80 (7.70)	2.30 (8.48)	1.65
5.	Spinosad 45 SC	0.20 g/l	1.41 (6.63)	1.20 (6.14)	1.54 (7.11)	2.57 (9.21)	3.55 (10.68)	2.48
6.	Emamectin benzoate 5 SG	0.25 g/l	0.28 (1.74)	1.20 (6.14)	0.78 (4.06)	1.31 (7.27)	1.69 (7.31)	1.25
7.	Chlorpyriphos 50% + cypermethrin 5% EC	0.10g/l	1.11 (6.01)	2.52 (8.60)	1.76 (7.53)	3.25 (10.37)	3.75 (11.05)	2.82
8.	Acephate 50% + imidacloprid 1.8% SP	0.20g/l	2.00 (7.87)	1.38 (5.39)	0.82 (4.22)	1.62 (7.47)	1.92 (7.89)	1.43
9.	Acephate 75% SP	1.00g/l	1.53 (6.26)	2.38 (8.48)	1.65 (7.35)	2.63 (9.54)	3.69 (10.94)	2.59
10.	Control		2.47 (8.99)	9.65 (18.04)	10.47 (18.76)	9.67 (18.10)	13.60 (21.61)	10.85
CD@5%			NS	2.37	2.04	2.4	2.1	
S.Em. ±			0.5	0.79	0.68	0.8	0.7	

Note: DBS- Day before spray; DAS-Days after spraying;*Mean of 3 replications; ** Figures in parenthesis are Angular transformed values

Table 2: Effect of insecticidal treatments against rice leaf folder after 2nd insecticidal spray.

Sr. No.	Treatments	Dosage *a.i*/l	Per cent leaf damage per 10 hills at different days after 2nd insecticidal spray					Post treatment mean
			1DBS	1DAS	3DAS	7DAS	10DAS	
1.	Thiacloprid 240 SC	0.25 g/l	7.97* (16.36) **	3.12 (10.02)	5.18 (13.09)	6.61 (14.81)	12.69 (20.86)	6.90
2.	Fipronil 5 SC	2.00 g/l	7.95 (16.31)	4.21 (11.56)	16.86 (20.90)	8.67 (16.96)	15.79 (23.40)	11.38
3.	Chlorfenapyr 2 SC	2.00 g/l	11.62 (19.81)	2.45 (8.89)	4.53 (12.10)	5.56 (13.59)	10.95 (19.31)	5.87
4.	Flubendiamide 480 SC	0.10 g/l	19.54 (27.73)	2.34 (8.65)	4.40 (12.05)	5.47 (13.08)	9.93 (18.35)	5.54
5.	Spinosad 45 SC	0.20 g/l	7.94 (16.35)	3.05 (9.69)	4.79 (12.63)	6.60 (14.68)	11.94 (20.21)	6.60
6.	Emamectin benzoate 5 SG	0.25 g/l	11.46 (19.43)	1.35 (6.62)	2.65 (9.26)	4.80 (12.60)	6.62 (14.9)	3.85
7.	Chlorpyriphos 50% + cypermethrin 5% EC	0.10g/l	8.63 (16.99)	3.28 (10.07)	5.29 (13.12)	7.91 (16.06)	12.92 (21.03)	7.35
8.	Acephate 50% + imidacloprid 1.8% SP	0.20g/l	24.12 (29.89)	2.14 (8.24)	3.60 (10.70)	4.96 (12.84)	8.60 (17.03)	4.83
9.	Acephate 75% SP	1.00g/l	5.84 (13.96)	2.61 (9.2)	4.73 (12.54)	5.78 (13.73)	11.10 (19.43)	6.05
10.	Control		26.13 (30.61)	25.81 (30.49)	30.13 (33.24)	34.19 (35.75)	30.80 (33.69)	30.23
	CD at 5%		NS	1.8	2.01	1.98	1.92	
S.Em. ±			0.51	0.63	0.67	0.66	0.64	

Note: DBS- Day before spray; DAS-Days after spraying; *Mean of 3 replications; ** Figures in parenthesis are Angular transformed values

CONCLUSION

The present investigation revealed that all the tested newer insecticides were effective against rice leaf folder management. Among those Emamectin benzoate 5 SG recorded lowest leaf damage (1.25%), which was on par with Acephate 50% + Imidacloprid 1.8% SP, Flubendiamide 480 SC, Thiacloprid 240 SC, Spinosad 45SC, Acephate 75 SP, Chlorpyriphos 50% + Cypermethrin 5% EC, Fipronil 5SC. In fact, the adverse effects of insecticides on biodiversity limit their usage. Hence, there are several botanical insecticides which yield better results and not have adverse effect on the biodiversity.

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