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EFFICACY OF SOME INSECTICIDES IN COMBINATION WITH NEEM ON RICE PLANTHOPPERS

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ABSTRACT

A field experiment was carried out during kharif 2020, at the Agricultural College Farm, Bapatla to evaluate the efficacy of some insecticides in combination with neem against rice planthoppers in direct seeded rice crop. The results showed that triflumezopyrim 10.6SC @ 25g a.i. ha^{-1} was the most effective treatment against both brown planthopper *Nilaparvata lugens* (Stål) and white backed planthopper *Sogatella furcifera* (Horváth) with 73.61 and 77.69% reductions over untreated control, respectively at 5 DAT. The other effective treatments were dinotefuran 20SG @ 40 g a.i. ha^{-1} and pymetrozine 50WG @ 150 g a.i. ha^{-1} with 70.14 and 66.44% reduction of *N. lugens* and 71.89 and 69.66% reduction of *S. furcifera*, respectively over untreated control at 5 DAT. Neem formulation 1500 ppm revealed the lowest efficacy with 34.95 and 36.19% reduction of *N. lugens* and *S. furcifera* over the untreated control at 5 DAT.

Key words: Direct seeded rice (DSR), *Nilaparvata lugens*, *Sogatella furcifera*, insecticides, neem formulation, triflumezopyrim, dinotefuran, pymetrozine, efficacy, incidence, population reduction.

Brown planthopper *Nilaparvata lugens* (Stål) and white backed planthopper *Sogatella furcifera* (Horváth) are regarded as economically the most significant rice pests in Asia (Zhang et al., 2014). Both nymphs and adults suck the sap from the base of tillers which results in "hopper burn" symptoms where plants turn yellow and dry up rapidly. Severe infestation causes lodging of the crop resulting in yield loss ranging from 10-70%. Despite the development of several methods for pest management of rice, the use of insecticides remains a major strategy. The reliance on chemical insecticides has resulted in the destruction of natural enemies, resulting in the resurgence of various primary and secondary pest species and development of insecticide resistant populations. The present study evaluates the efficacy of some insecticides in combination with neem products against rice planthoppers.

MATERIAL AND METHODS

A field experiment was conducted at the Agricultural College Farm, Bapatla, Andhra Pradesh (15.9156492, 80.4783481, 690 masl) during kharif, 2020. DSR crop was raised with Samba Masuri (BPT 5204) variety and the experiment was laid in a randomized block design (RBD) with eight treatments including untreated check. These treatment plots were replicated thrice with each plot measuring 25 m^2 area. The treatments include T_1: Triflumezopyrim 10.6SC @ 25 g a.i. ha^{-1}, T_2: Dinotefuran 20SG @ 40 g a.i. ha^{-1}, T_3: Pymetrozine 50WG @ 150 g a.i. ha^{-1}, T_4: Neem formulation 1500 ppm @ 5 ml l^{-1}, T_5: Triflumezopyrim + neem formulation @ 12.5 g a.i. ha^{-1} + 5 ml l^{-1}, T_6: Dinotefuran + neem formulation @ 20 g a.i. ha^{-1} + 5 ml l^{-1}, T_7: Pymetrozine + neem formulation @ 75 g a.i ha^{-1} + 5 ml l^{-1}, T_8: Untreated control. The treatment sprays were imposed twice at an interval of 25 days coinciding with peak tillering and panicle initiation stages when the pest density crossed the ETL. The data on incidence of *N. lugens* and *S. furcifera* which appeared simultaneously was recorded on 10 randomly selected hills from each plot at one day before imposing the treatments, three and five days after treatment (DAT). The data on the incidence of *N. lugens* an *S. furcifera* were transformed to square root values. ANOVA was used to analyse the data and mean values were compared using LSD (Duncan, 1951). The reduction of planthopper population at each count was also calculated using Abbott's formula (Fleming and Ratnakaran, 1985). All the statsistical analysis was performed using the IBM SPSS Statistics 20 software.

RESULTS AND DISCUSSION

The results on overall cumulative efficacy of different insecticidal treatments on *N. lugens* after two sprays at 5DAT revealed that triflumezopyrim 10.6SC @ 25 g a.i. ha^{-1} was the best treatment, with 73.61% reduction over untreated control, followed by dinotefuran 20SG @ 40 g

Table 1. Efficacy of insecticides against *N. lugens* and *S. furcifera* (kharif, 2020)

T. No.	Treatments	Dosage	Population reduction over control (%)								Yield kg ha^{-1}
			N. lugens reduction %				*S. furcifera* reduction %				
			First spray		Second spray		First spray		Second spray		
			3 DAT	5 DAT	3 DAT	5 DAT	3 DAT	5 DAT	3 DAT	5 DAT	
1	Triflumezopyrim 10.6SC	25g a.i. ha^{-1}	54.65^{a} (47.69)	75.53^{a} (60.38)	53.80^{a} (47.20)	73.61^{a} (59.12)	57.90^{a} (49.57)	80.08^{a} (63.52)	57.49^{a} (49.33)	77.69^{a} (61.84)	4974
2	Dinotefuran 20SG	40g a.i. ha^{-1}	46.51^{ab} (43.02)	69.75^{ab} (56.66)	45.48^{a} (42.43)	70.14^{ab} (56.90)	52.11^{ab} (46.23)	74.33^{ab} (59.59)	51.61^{ab} (45.94)	71.89^{ab} (58.01)	4720
3	Pymetrozine 50WG	150g a.i. ha^{-1}	44.19^{abc} (41.68)	68.21^{ab} (55.71)	43.64^{a} (41.36)	66.44^{ab} (54.62)	50.17^{ab} (45.12)	72.41^{ab} (58.35)	51.15^{ab} (45.68)	69.66^{ab} (56.60)	4619
4	Neem formulation 1500 ppm	5 ml l^{-1}	22.29^{d} (28.18)	42.77^{c} (40.87)	18.92^{b} (25.80)	34.95^{c} (36.26)	28.93^{e} (32.56)	35.25^{c} (36.44)	29.44^{d} (32.88)	36.19^{c} (37.00)	3445
5	Triflumezopyrim + neem formulation 1500 ppm	12.5g a.i. ha^{-1} + 5 ml l^{-1}	41.67^{abc} (40.22)	64.74^{ab} (53.60)	43.87^{a} (41.50)	59.26^{ab} (50.36)	48.24^{ab} (44.02)	66.28^{ab} (54.53)	47.08^{abc} (43.35)	64.75^{ab} (53.60)	4195
6	Dinotefuran + neem formulation 1500 ppm	20g a.i. ha^{-1} + 5 ml l^{-1}	35.66^{bc} (36.68)	59.73^{b} (50.64)	40.86^{a} (39.76)	56.94^{b} (49.02)	44.38^{b} (41.79)	63.22^{ab} (52.69)	39.85^{bcd} (39.16)	61.18^{ab} (51.49)	4002
7	Pymetrozine + neem formulation 1500 ppm	75g a.i ha^{-1} + 5 ml l^{-1}	32.36^{cd} (34.69)	58.77^{b} (50.07)	39.94^{a} (39.22)	53.94^{b} (47.28)	42.84^{b} (40.90)	61.30^{b} (51.56)	36.68^{cd} (37.29)	58.05^{b} (49.66)	3967
8	Untreated control		-	-	-	-	-	-	-	-	3039
	SEm±		2.40	2.37	2.50	2.88	2.04	3.30	2.17	3.03	-
	Fcal		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	-
	CD (P= 0.05)		8.29	8.20	8.66	9.96	7.04	11.41	7.51	10.48	-
	CV (%)		16.31	11.92	16.72	15.07	12.56	16.22	13.70	15.23	-

Sig - Significant; DAT- Days after treatment; Figures in parentheses corresponding logorithamic transformation; in column means with same letters do not differ significantly by LSD ($p<0.05$).

a.i. ha^{-1} (70.14%) and pymetrozine 50WG @ 150 g a.i. ha^{-1} (66.44%), triflumezopyrim + neem formulation @ 12.5 g a.i. ha^{-1} + 5 ml l^{-1} (59.26%), dinotefuran + neem formulation @ 20 g a.i. ha^{-1} + 5 ml l^{-1} (56.94%) and pymetrozine + neem formulation @ 75 g a.i. ha^{-1} + 5 ml l^{-1} (53.94%) in decreasing order of their efficacy. The neem formulation 1500 ppm @ 5 ml l^{-1} recorded 34.95% reduction over untreated control. Overall cumulative efficacy of insecticidal treatments on *S. furcifera* after two sprays at 5DAT followed the same trend as that of *N. lugens* with triflumezopyrim 10.6SC @ 25 g a.i. ha^{-1} as the best treatment with 77.69% reduction over untreated control; this is followed by dinotefuran 20SG @ 40 g a.i. ha^{-1} (71.89%) and pymetrozine 50WG @ 150 g a.i. ha^{-1} (69.66%), triflumezopyrim + neem formulation @ 12.5 g a.i. ha^{-1} + 5 ml l^{-1} (64.75%), dinotefuran + neem formulation @ 20 g a.i. ha^{-1} + 5 ml l^{-1} (61.18%) and pymetrozine + neem formulation @ 75 g a.i ha^{-1} + 5 ml l^{-1} (58.05%) in decreasing order of their efficacy. The neem formulation 1500 ppm @ 5 ml l^{-1} recorded 36.19% reduction over untreated control. Triflumezopyrim 10.6SC @ 25 g a.i. ha^{-1} was found to be the most effective insecticide in reducing *N. lugens* and *S. furcifera* incidence both at three and five DAT. The response of these insecticides was also observed on grain yield with highest yield of 4974 kg ha^{-1} in triflumezopyrim 10.6SC @ 25 g a.i. ha^{-1} treated plots (Table 1).

The present findings corroborate with Kumar et al. (2017) who reported the superiority of triflumezopyrim 10.6SC @ 237 ml ha^{-1} by registering only 1.83 *N. lugens* and 2.08 *S. furcifera*/ hill. Dhaka et al. (2020) reported that field application of triflumezopyrim 10SC @ 235 ml ha^{-1} was found superior and registered 1.88 and 1.26 hoppers/ hill against *N. lugens* and *S. furcifera* followed by pymetrozine 50WG @ 300g ha^{-1} with 2.12 and 1.26 hoppers of *N. lugens* and *S. furcifera*/ hill, respectively and also with highest grain yield of 55.58 q ha^{-1} in triflumezopyrim 10SC @ 235 ml ha^{-1} followed by pymetrozine 50WG @ 300g per ha (53.79 q ha^{-1}). According to Umiam and Singh (2018), the planthopper population under triflumezopyrim treatment was 18.7 and 7.3 hoppers/ 10 hills at 70 and 80 days after transplanting, respectively, compared to 1068/ 10 hills in the untreated control. Sujay et al. (2020) reported that application of dinotefuran 70WG @ 61.6g a.i. ha^{-1} was found to be an excellent insecticide in suppressing the *N. lugens* and *S. furcifera* during kharif, 2018. Randhawa et al. (2022) reported the superiority of dinotefuran 20SG. Seni and Naik (2017) reported that the pymetrozine 50WG @ 150g a.i. ha^{-1} recorded significantly higher reduction of hoppers.

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AUTHOR CONTRIBUTION STATEMENT

Dhyan Chowdary conducted the original experiment and wrote the original manuscript and did the data analysis. Ramachandra Rao, Madhumathi and Anil Kumar supervised and corrected the manuscript.

CONFLICTS OF INTEREST

No conflict of interest.

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