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Bioefficacy of New insecticide molecules Against Sugarcane Early Shoot borer *Chilo infuscatellus* (Snellen) in Kolhapur Region of Maharashtra.

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Abstract: *Among the evaluated new insecticide molecules rynoxypyr 20 SC @ 40 g a.i./ha proved to be most effective against C. infuscatellus (Snellen) in which minimum dead hearts (4.51 per cent) and (3.61) were recorded at the time of first spraying and second spraying, respectively. The next best treatment in order of effectiveness were flubendiamide 480 SC @ 30 g a.i./ha, indoxacarb 14.5 SC @ 30 g a.i./ha, cartap hydrochloride 50 SP @ 375 g a.i./ha, lambda cyhalothrin 5EC @ 25 g a.i./ha, imidacloprid 17.8 SL @ 25 g a.i./ha. And thiodicarb, observed to be comparatively least effective against sugarcane early shoot borer..*
Key word: *Bioefficacy, sugarcane, early shoot borer, rynaxypyr, flubendiamide, fipronil*

I. Introduction

Sugarcane *Saccharum officinarum* L. is a tropical plant belonging to the family Poaceae. It is an important commercial crop of the country. Among sugarcane growing countries in the world, India ranks second by contribution 4202 ha area. In Maharashtra sugarcane is grown on 10.22 million hectares with annual production of 649 million tonnes and productivity 76.8 tonnes per hectare. About 35 million farmers in the country depend on the sugarcane for their livehood. Sugar industry is the second largest agro-based industry comprising of 488 in India whereas 147 in Maharashtra (Anon. 2013). Major sugarcane growing districts in Maharashtra are Kolhapur, Satara, Sangali, Ahmednagar, Pune, Nashik and Solapur.

The shoot Borer, *Chilo infuscatellus* (Snellan) (Pyralidae; Lepidoptera) cause economic losses (Avasthy and Tiwari, 1986) from 22-23 per cent in yield, 12 per cent in sugar recovery and 27 per cent in Jaggary (Patil and Hapse,1981).The pest is mainly injuries to young cane up to 8 weeks after planting. The caterpillars after hatch out from eggs get scattered and enters into the young shoots by making the holes just above ground levels and tunnels downwards. The central shoot dries up causing 'dead hearts'. It is a characteristic sign of the presence of the pest within the plants. The dead heart can be easily pulled out of the central shoot, roots inside the stem and emits an offensive smell on being pulled out. From time to time several insecticides were tried and recommended for the management of early shoot borer. In spite of that the problem of early shoot borer still persists. Therefore, the efforts are made to find out the effective new molecules for management of early shoot borer in sugarcane.

II. Material And Methods

The experiments was laid out in randomized block design with nine treatments including control and replicated thrice in 6 × 2 M^2 plot size March 2012 at farmers field in Gudhalwadi village Tal. Radhanagri Dist. Kolhapur. The sugarcane variety CO-86032 (Nira) was planted as per recommended package of practices except plant protection measures. The required quantity of spray solution was calibrated by spraying the control plot with water alone. Insecticide required for spraying for preparation of spray fluid per plot of different concentrations were worked out at the time of spraying and mixed in clean water. The spraying of insecticides was carried out during morning hours by hand operated knapsack sprayer. All the three plots of treatment in three replications were treated at a time. In all total two sprays were given one at vegetative stage. The care was taken to cover all the plant parts thoroughly. The spray pump was thoroughly washed with water while switching on one insecticide to another.

Observations

The efficacy of various insecticides against early shoot borer was judged on the basis of the per cent dead hearts at vegetative stage. The observations on the dead hearts and on ten hills selected randomly for each plot and tagged. Dead hearts were recorded one day before spraying and 7, 15, 21 days after spraying. The data were subjected to analysis of variance by Panse and Sukhatme (1985).

III. Results And Discussion

First spraying

The data presenting dead heart by *C. infuscatellus* (Snellan) under field condition are given in Table 1. The result revealed that no significant differences were observed in the per cent dead heart between insecticides

treatment and untreated control at day before spraying (DBS), indicating the uniform infestation throughout experimental field.

The observations on dead heart in different insecticidal treatment ranged from 4.51 to 6.67 per cent as in untreated control (Table 1). Among the treatments, rynoxypar @ 40 g a.i./ha was found to be significantly superior over all other treatment and recorded 4.51 per cent dead hearts when observation were recorded 7 DAS. The treatment with flubendiamide 480 SC @ 30 g a.i./ha was next in order of efficacy (4.78 per cent dead hearts). The significant difference did not exist among the treatment with indoxacarb 14.5 SC, cartap hydrochloride 50 SP and lambda cyhalothrin 5 EC. The next best treatments in order of their efficacy were imidacloprid, And thiodicarb were 6.67 per cent dead hearts were observed, respectively.

The dead hearts percentage was significantly low in all the insecticidal treatments as compare to untreated control when observations recorded 7 DAS. rynoxypyr 20 SC was found superior over all the remaining treatments by recording lowest dead heart 4.10 per cent, flubendiamide 480 SC stood second in order of effectiveness which recorded 4.61 per cent dead hearts. However, it was on par with Fipronil 5 SC where 4.76 per cent dead hearts were recorded. Treatment with indoxacarb 14.5 SC recorded 5.17 per cent dead hearts and found to be on par with cartap hydrochloride 50SP recorded 5.55 per cent dead hearts. Among the remaining treatments lamda cyhalothrin, imidacloprid and thiodicarb proved least effective in which higher per cent dead hearts of 5.82, 6.14 and 6.49 per cent were observed, respectively.

The data on per cent dead hearts recorded 21 DAS showed that rynoxypyr 20 SC was found consistantly to be the most promising treatment where lowest (3.63 per cent) dead hearts were recorded. The treatment with flubendiamide 480 SC continued to be best treatment next in order of effectiveness by where 3.92 per cent dead hearts. Were recorded Fipronil 5 SC recorded 4.09 per cent dead hearts and stood third in order. Treatments with Indoxacarb 14.5 SC recorded 4.55 per cent dead hearts and found on par with cartap hydrochloride 50 SP where 4.83 per cent dead hearts were observed. This was followed by the treatment with lamda cyhalothrin, imidacloprid, thiodicarb in which 5.08, 5.54 and 5.82 per cent dead hearts were recorded. Overall performance of various insecticidal treatments based on the mean indicated that treatment with rynoxypyr 20 SC was found to be most effective and significantly superior over all other treatments in reducing the dead hearts to minimum level of 4.08 per cent. Flubendiamide 480 SC stood second in order of effectiveness which recorded 4.44 per cent dead hearts. Treatment with Fipronil 5 SC proved next effective treatment by recording 4.75 per cent dead hearts.

The treatment with Indoxacarb 14.5 SC recorded 5.06 per cent dead hearts and was found at par with the cartap hydrochloride 50 SC which 5.34 per cent dead hearts were observed. This was followed by the treatment lamda cyhalothrin, imidacloprid, thiodicarbin which 5.67, 6.03 and 6.33 per cent dead hearts noticed as against 8.77 per cent in untreated control.

Second spraying

The data presenting dead heart by *C. infuscatellus* (Snellen) under field condition are presented in Table 2. The results reveled that no significant difference in the per cent dead hearts between insecticides treatment and untreated control at A day before spraying (ADBS) indicating the uniform infestation. It could be seen from Table 2 that dead hearts observed in different insecticide treatments were between 3.61 to 5.55 per cent as against 6.44 per cent in untreated control when observations were recorded 5^{th} days after the spraying. Among the insecticides tested treatment with rynoxypyr 20 SC @ 30 g a.i./ ha proved to be the most effective and superior over the rest of the treatments and recorded lowest (3.61 per cent) dead hearts. The treatment with flubendiamide 480 SC @ 30 g a.i. /ha stood second in order of effectiveness by recording 3.92 per cent dead hearts. The next best treatment in order of efficacy was fipronil 5 SC recorded 4.23 per cent dead hearts and found at par with Indoxacarb 14.5 SP recording 4.39 per cent dead hearts. The next best treatment in order of their efficacy is cartap hydrochloride 50 SP and lamda cyhalothrin, 5EC, where 4.69 and 4.94 per cent dead heart recorded respectively. This was followed by the treatment with imidacloprid and thiodicarb in which 5.22 and 5.55 per cent dead hearts observed, respectively as against 6.44 per cent in untreated control.

The next best treatment in order of efficacy was fipronil 5 SC recorded 4.23 per cent dead hearts and found at par with Indoxacarb 14.5 SP recording 4.39 per cent dead hearts. The next best treatment in order of their efficacy is cartap hydrochloride 50 SP and lamda cyhalothrin, 5EC, where 4.69 and 4.94 per cent dead heart recorded respectively. This was followed by the treatment with imidacloprid and thiodicarb in which 5.22 and 5.55 per cent dead hearts observed, respectively as against 6.44 per cent in untreated control.

Days after spraying the dead hearts percentage was significantly low in all the treatments as compared to untreated control rynoxpyr 20 SC was found superior over all the remaining treatments by recording lowest dead hearts 3.09 per cent. Flubendiamide 480 SC stood second in order of effectiveness where 3.34 per cent dead hearts were recorded. Treatment with fipronil 5 SC proved next effective treatment by recording 3.59 per cent dead heart. Treatment with Indoxacarb 14.5 SP recorded 3.84 per cent dead hearts and found at par with cartap hydrochloride 50SP recorded 4.02 per cent dead hearts. Among the remaining treatments lamda

cyhalothrin, imidacloprid, and thiodicarb proved least effective in which higher per cent dead hearts of 4.33, 4.60 and 4.91 per cent were observed, respectively. Whereas 6.63 per cent dead hearts were recorded in untreated control

Table.1 Bioefficacy of new insecticide molecules against early shoot borer (percent dead hearts)

Sr. No.	Insecticides	Dose/ha	Per cent dead hearts				Mean
			DBS	7 DAS	15 DAS	21 DAS	
1.	Flubendiamide 480 SC	30 g a.i.	8.01* (16.43)**	4.78 (12.66)	4.61 (12.34)	3.92 (11.35)	4.44 (12.12)
2.	Indoxacarb 14.5 SC	30 g a.i.	8.45 (16.88)	5.51 (13.50)	5.17 (13.24)	4.55 (12.29)	5.06 (12.96)
3.	Fipronil 5SC	30 g a.i.	8.02 (16.46)	5.41 (13.44)	4.76 (12.61)	4.09 (11.74)	4.75 (12.60)
4.	Imidacloprid 17.8 SL	25 g a.i.	7.24 (15.60)	6.42 (14.65)	6.14 (14.35)	5.54 (13.54)	6.03 (14.18)
5.	Lambda cyhalothrin 5 EC	25 g a.i.	8.13 (16.57)	6.11 (14.30)	5.82 (13.98)	5.08 (13.10)	5.67 (13.80)
6.	Cartap hydrochloride 50 SP	375 g a.i.	8.02 (16.46)	5.64 (13.73)	5.55 (13.59)	4.83 (12.65)	5.34 (13.20)
7.	Thiodicarb	30 g a.i	7.66 (16.18)	6.67 (14.99)	6.49 (14.73)	5.82 (13.99)	6.33 (14.57)
8.	Rynoxypyr	40 g a.i	7.78 (16.25)	4.51 (12.29)	4.10 (11.68)	3.63 (10.93)	4.08 (11.53)
9.	Untreated control	--	8.32 (16.74)	8.23 (16.68)	8.94 (17.41)	9.13 (17.57)	8.77 (17.22)
	S.E.		N.S	0.11	0.12	0.13	0.12
	C.D. @ 5%		N.S	0.32	0.36	0.38	0.35

**Figures in parenthesis are arsine transformed values.
*Mean of three replications

Table.2 Bioefficacy of new insecticide molecules against early shoot borer (per cent dead hearts)
**Figures in parenthesis are arsine transformed values.

Sr. No.	Insecticides	Dose/ha	Per cent dead hearts				Mean
			DBS	7 DAS	15 DAS	21 DAS	
1.	Flubendiamide 480 SC	30 g a.i.	4.23* (11.83)**	3.92 (11.39)	3.34 (10.58)	2.91 (9.85)	3.39 (10.61)
2.	Indoxacarb 14.5 SC	30 g a.i.	4.55 (12.25)	4.39 (12.13)	3.84 (11.39)	3.55 (10.73)	3.92 (11.37)
3.	Fipronil 5 SC	30 g a.i.	4.54 (12.30)	4.23 (11.85)	3.59 (10.97)	3.19 (10.25)	3.67 (11.02)
4.	Imidacloprid 17.8 SL	25 g a.i.	5.75 (13.87)	5.22 (13.81)	4.60 (12.43)	4.45 (12.18)	4.76 (12.60)
5.	Lambda cyhalothrin 5 EC	25 g a.i.	5.04 (12.95)	4.94 (12.81)	4.33 (11.98)	3.93 (11.44)	4.40 (12.08)
6.	Cartap hydrochloride 50 SP	375 g a.i.	4.89 (12.81)	4.69 (12.47)	4.02 (11.57)	3.59 (10.88)	4.10 (11.64)
7.	Thiodicarb	30 g.a.i	5.74 (13.80)	5.55 (13.60)	4.91 (12.82)	4.66 (12.52)	5.06 (13.05)
8.	Rynoxypyr	40 g a.i	4.62 (12.35)	3.61 (10.98)	3.09 (10.17)	2.68 (9.42)	3.13 (10.19)
9.	Untreated control	--	5.84 (13.95)	6.44 (14.67)	6.63 (14.88)	6.73 (15.03)	6.60 (14.86)
	S.E.		N.S	0.11	0.12	0.13	0.12
	C.D. @ 5%		N.S	0.33	0.36	0.38	0.35

*Mean of three replications

The data on per cent dead hearts recorded 21 DAS indicated that rynoxpyr 20 SC was the most promising recording the lower of 2.68 per cent dead hearts. The treatment with flubendiamide 480 SC continued to be best treatment in order of effectiveness by recording 2.91 per cent dead hearts. Fipronil 5 SC recorded 3.19 per cent dead hearts and stood third in order. Treatments with Indoxacarb 14.5 SC recorded 3.55 per cent dead hearts and found at par with cartap hydrochloride 50 SP in which 3.59 per cent dead hearts were observed. This was followed by the treatment with lamda cyhalothrin, imidacloprid, and thiodicarb in which 3.93, 4.45 and 4.66 per cent dead hearts were observed, respectively.

Overall performance of various insecticidal treatments based on the mean indicated that treatment with rynoxpyr 20 SC was the most effective and significantly superior over all other treatments in reducing the dead hearts to minimum level of 3.13 per cent. Sheeba Jasmine (2012) and Gaje Singh *et al*. (2009) also postulated

that rynaxpyr most effective treatment recording the lowest incidence of sugarcane early shoot borer (15.43%) flubendiamide 480 SC stood second in order of effectiveness which recorded 3.39 per cent dead hearts. Treatment with fipronil 5 SC proved next effective treatment by recording 3.67 per cent dead hearts and found at par with Indoxcarb14.5 SC which recorded 3.92 per cent dead hearts. These results are in aggrement with Sidde Gowda *et al.* (2006) reported that Indoxcarb 14.5 SG new insecticides @ 37.5 g a.i /ha belonging to oxidize group which is most effective against Lepidopterian pest in rice ecosystem. Cartap hydrochloride 50 SP and lamda cyhalothrin 5 EC recorded 4.10 and 4.40 per cent dead hearts respectively. The imidacloprid and thiodicarb proved least effective in which higher per cent of dead hearts of4.76 and 5.06 were observed. The untreated control recorded 6.60 per cent dead hearts.

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