

# EFFICACY OF CHLORANTRANILIPROLE 20 SC AGAINST YELLOW STEM BORER, *SCIRPOPHAGA INCERTULAS* (WALKER) IN BASMATI RICE

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## ABSTRACT

A field experiment was conducted to evaluate the efficacy of different concentrations of chlorantraniliprole 20 SC and cartap hydrochloride 50 SP, trizophos 40 EC and chlorpyrifos 20 EC against yellow stem borer, *Scirpophaga incertulas*(Walker) in basmati rice at Crop Research Center, SardarVallabhbhai Patel University of Agriculture and Technology, Meerut during *Kharif* 2014. All the treatments were found significantly effective in reducing the infestation and increasing the yield as compared to control. Chlorantraniliprole 20 SC @ 180 ml/ha was best with final infestation of 0.47 percent and 40.35 q/ha yield followed by chlorantraniliprole 20 SC @ 150 ml/ha, chlorantraniliprole 20 SC @ 120 ml/ha, chlorantraniliprole 20 SC @ 90 ml/ha, trizophos 40 EC @ 1000 ml/ha, cartap hydrochloride 50 SP @ 1000 g/ha and chlorpyrifos 20 EC @ 1000 ml/ha, which gave 39.75, 38.45, 38.05, 37.15, 37.05 and 34.65 q/ha yield, respectively. Thus, chlorantraniliprole 20 SC @ 180 ml/ha can be utilized in the management of yellow stem borer.

## INTRODUCTION

Basmati rice which is mainly known for its aroma, fragrance and super fine kernels is grown mainly in the western part of Uttar Pradesh, Uttarakhand, Haryana and Punjab. In India it occupies an area of about 43.95 million hectares with total production of 106.54 million tones and productivity of 2.4 tones/ hectare. In Uttar Pradesh, it is grown in about 5.98 million hectare with total production of 14.63 million tones and productivity of 2.5 tones per hectare (Anonymous 2014).

The crop suffers severely due to attack of various insect pests which reduces its yield and quality. Among them, the yellow stem borer, *Scirpophaga incertulas* (Walker) is quite serious as it can cause 25-30 per cent damage to the crop manifests as dead hearts in vegetative stage and white ear with chaffy grains during heading stage (Rath, 2001, Sachan *et al.*, 2006 and Satyanarayana *et al.*, 2015). Farmers still consider application of insecticides as a key component of integrated pest Management programme. Now a day's many new emerging chemicals are available in the market with good efficacy for pest control and safety to non target organisms. Chlorantraniliprole (Coragen 20SC) is one such new chemical and belongs to anthranilamide group. When anthranilamides bind to ryanodine receptors of insect muscles, the muscles contract leading to paralysis and death (Bhanu *et al.* 2015). Therefore, the present investigation was undertaken to evaluate the efficacy of different concentrations of chlorantraniliprole 20 SC against yellow stem borer in basmati rice.

## MATERIALS AND METHODS

The present investigation was carried out during *Kharif* 2014 at Crop Research Center, SardarVallabhbhai Patel University of Agriculture and Technology, Meerut in a randomized block design with three replications. Twenty five days old seedlings of basmati rice variety Pusa Basmati-1 was transplanted on July 22, 2014 in a plot of 5x4 m<sup>2</sup> keeping two seedlings per hill. All the agronomical practices, except the package recommended for insect pest management were adopted to raise a good crop. There were eight treatments comprised of four different doses of chlorantraniliprole 20 SC @ 180 ml/ha, 150 ml/ha, 120 ml/ha and 90 ml/ha, trizophos 40 EC @ 1000 ml/ha, cartap hydrochloride 50 SP @ 1000 ml/ha, chlorpyrifos 20 EC @ 1000 ml/ha and one untreated control. All treatments were applied twice during the crop season first at 50 days and second at 75 days after transplanting.

Observations on infestation of yellow stem borer as dead hearts and white ear heads were recorded on ten randomly selected hills from three central row one day before and 3, 7, 14 and 21 days after each application of insecticides (Chormule *et al.*, 2014). The grain yield of each plot was recorded at the time of harvesting. Statistical analysis was done as suggested by Panse and Sukhatme (1985).

## RESULTS AND DISCUSSION

**Efficacy of different treatments against stem borer, *S. incertulas* following first application**

The results revealed that all the treatments were significantly effective in reducing the infestation of stem borer and thus increasing the yield significantly as compared to control. The initial stem borer infestation recorded as dead hearts ranged from 4.70 to 5.78 per cent before the spray and did not differ significantly (Table 1).

Observations recorded on 3<sup>rd</sup> day after first spray indicates that all the treatments were found statistically superior over control in minimizing the dead heart caused by *S. incertulas*. The minimum stem borer infestation (1.04 per cent) was recorded in the plot treated with chlorantraniliprole @ 180 ml/ha and it was statistically at par with chlorantraniliprole @ 150 ml/ha (1.14 per cent). The treatment chlorantraniliprole @ 120 ml/ha had 1.32 per cent dead hearts followed by chlorantraniliprole @ 90 ml/ha (1.95 per cent dead hearts), cartap hydrochloride @ 1000 g/ha (2.23 per cent dead hearts), trizophos @ 1000 ml/ha (2.35 per cent dead hearts) and chlorpyriphos @ 1000 ml/ha (2.55 per cent dead hearts). Maximum stem borer infestation (4.98 per cent) was recorded in control plot.

Data recorded on 7<sup>th</sup> day after first spray, the minimum dead hearts (0.76 per cent) was recorded with chlorantraniliprole @ 180 ml/ha and again proved best treatment. It was significantly superior to rest of treatments except chlorantraniliprole @ 150 ml/ha (0.89 per cent dead hearts). The next in order of effectiveness of treatments was chlorantraniliprole @ 120 ml/ha (1.02 per cent dead hearts), chlorantraniliprole @ 90 ml/ha (1.17 per cent dead hearts), cartap hydrochloride @ 1000 g/ha (2.08 per cent dead hearts), trizophos @ 1000 ml/ha (2.15 per cent dead hearts) and chlorpyriphos @ 1000 ml/ha (2.23 per cent dead hearts). The maximum damage was recorded in control plot with 5.28 per cent dead hearts.

On 14<sup>th</sup> day of first spray, chlorantraniliprole @ 180 ml/ha maintained its effectiveness and gave best performance (0.32 per cent dead hearts) and it was followed by chlorantraniliprole @ 150 ml/ha (0.44 per cent dead hearts). The other treatments like chlorantraniliprole @ 120 ml/ha, chlorantraniliprole @ 90 ml/ha, cartap hydrochloride @ 1000 g/ha, trizophos @ 1000 ml/ha and chlorpyriphos @ 1000 ml/ha were recorded 0.51, 0.57, 2.21, 2.32 and 2.44 per cent dead hearts, respectively. The maximum damage was recorded in control plot with 5.72 per cent dead hearts.

Observations recorded on 21<sup>th</sup> day after first application, showed increased pattern of dead hearts in all the treatments and maximum dead hearts 5.82 per cent was recorded in control plot. The minimum dead hearts (0.48 per cent) was recorded with the treatment chlorantraniliprole @ 180 ml/ha. It was statistically at par with chlorantraniliprole @ 150 ml/ha (0.55 per cent dead hearts). The next effective treatment was chlorantraniliprole @ 120 ml/ha (0.64 per cent dead hearts), chlorantraniliprole @ 90 ml/ha (0.72 per cent dead hearts), cartap hydrochloride @ 1000 g/ha (2.32 per cent dead hearts) and trizophos @ 1000 ml/ha (2.47 per cent dead hearts). Treatment chlorpyriphos @ 1000 ml/ha was recorded least effective with 2.63 per cent dead hearts.

**Efficacy of different treatments against stem borer, *S. incertulas* following second application**

**Table 1: Efficacy of different treatments against yellow stem borer, *Scirpophaga incertulas* (Walker)**

Treat ments	Treatment name	Dose/ha	Stem borer infestation (% Dead hearts/White ear heads)			Second application			Yield of treatments in yield over q/ha				
			First application DBS	3 DAS	7 DAS	14 DAS	21 DAS	7 DAS		14 DAS	21 DAS		
T <sub>1</sub>	Chlorantraniliprole 20 SC	90 ml/ha	4.70(12.44)	1.95(8.02)	1.17(6.20)	0.57(4.32)	0.72(4.86)	1.52(7.07)	1.06(5.90)	0.61(4.47)	0.78(5.06)	38.05	8.50
T <sub>2</sub>	Chlorantraniliprole 20 SC	120 ml/ha	4.93(12.82)	1.32(6.59)	1.02(5.41)	0.51(4.09)	0.64(4.58)	1.18(6.23)	0.98(5.67)	0.55(4.25)	0.67(4.69)	38.45	8.90
T <sub>3</sub>	Chlorantraniliprole 20 SC	150 ml/ha	5.34(13.15)	1.14(6.12)	0.89(4.99)	0.44(3.79)	0.55(4.25)	1.09(5.99)	0.89(5.41)	0.48(3.92)	0.59(4.40)	39.75	10.20
T <sub>4</sub>	Chlorantraniliprole 20 SC	180 ml/ha	5.22(13.20)	1.04(5.85)	0.76(5.41)	0.32(3.23)	0.48(3.97)	0.96(5.62)	0.76(4.99)	0.39(3.57)	0.47(3.92)	40.35	10.80
T <sub>5</sub>	Trizophos 40 EC	1000 ml/ha	5.78(13.90)	2.35(8.81)	2.15(8.42)	2.32(8.75)	2.47(9.03)	2.24(8.60)	2.05(8.22)	2.22(8.56)	2.38(8.87)	37.15	7.60
T <sub>6</sub>	Cartap hydrochloride 50 SP	1000 g/ha	5.67(13.75)	2.23(8.58)	2.08(8.28)	2.21(8.54)	2.32(8.75)	1.97(8.06)	1.68(7.44)	1.85(7.81)	2.13(8.38)	37.05	7.50
T <sub>7</sub>	Chlorpyriphos 20 EC	1000 ml/ha	5.45(13.30)	2.55(9.18)	2.23(8.58)	2.44(8.98)	2.63(9.32)	2.31(8.73)	2.12(8.36)	2.78(9.59)	2.95(9.88)	34.65	5.10
T <sub>8</sub>	Control		4.83(12.51)	4.98(12.88)	5.28(13.27)	5.72(13.83)	5.82(13.95)	6.24(14.46)	6.98(15.31)	7.62(16.01)	7.14(15.49)	29.55	-
SEm(±)	CD at 5%		0.81NS	0.040.12	0.040.14	0.040.12	0.040.12	0.030.11	0.030.10	0.050.16	0.040.12	-	-

Figures in parentheses are angular transformed values; DAS = Days after spray; DBS = Days before Spray

Almost a similar trend of effectiveness of treatments as in first application on reduction of dead hearts was recorded after the second spray and all the treatments proved better than the control (Table 1).

Observations recorded on 3<sup>rd</sup> day after second application revealed that all the treatments were found significantly superior than the control. The minimum dead hearts (0.96 per cent) was recorded with chlorantraniliprole @ 180 ml/ha followed by chlorantraniliprole @ 150 ml/ha (1.09 per cent dead hearts) and it was statistically at par with each other. The next in order of effectiveness of treatments was chlorantraniliprole @ 120 ml/ha, chlorantraniliprole @ 90 ml/ha, cartap hydrochloride @ 1000 g/ha, trizophos @ 1000 ml/ha and chlorpyrifos @ 1000 ml/ha with 1.18, 1.52, 1.97, 2.24 and 2.31 per cent dead hearts, respectively. Maximum dead hearts (6.24 per cent) was recorded in control plot.

Data recorded on 7<sup>th</sup> day of insecticidal application revealed that all the treatments maintained their efficacy and found significantly superior over control. The minimum dead hearts (0.76 per cent) was recorded with chlorantraniliprole @ 180 ml/ha. The second most effective treatment was chlorantraniliprole @ 150 ml/ha (0.89 per cent dead hearts) and it was statistically at par with chlorantraniliprole @ 120 ml/ha (0.98 per cent dead hearts). It was followed by chlorantraniliprole @ 90 ml/ha (1.06 per cent dead hearts), cartap hydrochloride @ 1000 g/ha (1.68 per cent dead hearts) and trizophos @ 1000 ml/ha (2.05 per cent dead hearts), respectively. Chlorpyrifos @ 1000 ml/ha was found least effective where 2.12 per cent dead hearts was recorded but it was better than control (6.98 per cent dead hearts).

On 14<sup>th</sup> day after spray, chlorantraniliprole @ 180 ml/ha again proved most effective with 0.39 per cent dead hearts and it was statistically at par with chlorantraniliprole @ 150 ml/ha (0.48 per cent dead hearts). The chlorpyrifos @ 1000 ml/ha was found least effective where 2.78 per cent dead hearts was recorded but it was better than control in controlling stem borer infestation.

Observations recorded on 21<sup>st</sup> day after second application revealed that chlorantraniliprole @ 180 ml/ha maintained its effectiveness and gave the best performance (0.47 per cent dead hearts) and it was statistically at par with chlorantraniliprole @ 150 ml/ha (0.59 per cent dead hearts). The next in order of effectiveness of treatments was chlorantraniliprole @ 120 ml/ha, chlorantraniliprole @ 90 ml/ha, cartap hydrochloride @ 1000g/ha, trizophos @ 1000 ml/ha and chlorpyrifos @ 1000ml/ha with 0.67, 0.78, 2.13, 2.38 and 2.95 per cent dead hearts, respectively. Maximum dead hearts (7.14 per cent) was recorded in control plot.

A significantly higher grain yield was recorded in all treated plots and varied from 34.65 to 40.35 q/ha as compared to control (29.55 q/ha). The maximum yield was obtained from the chlorantraniliprole @ 180 ml/ha treated plot giving 40.35 q/ha and it was superior over rest of the treatments. The chlorantraniliprole @ 150 ml/ha was second most effective treatment with grain yield of 39.75 q/ha followed by chlorantraniliprole @ 120 ml/ha, chlorantraniliprole @ 90 ml/ha, trizophos 1000 ml/ha and cartap hydrochloride @ 1000 g/ha, with the grain yield of 38.45, 38.05, 37.15 and 37.05 q/ha, respectively. Among the different treatments lowest

yield (34.65 q/ha) was found in case of chlorpyrifos @ 1000 ml/ha. Increase in yield over control varied from 5.10 to 10.80 q/ha in different treatments. Maximum increase in yield (10.80 q/ha) was recorded in chlorantraniliprole @ 180 ml/ha treated plot followed by chlorantraniliprole @ 150 ml/ha in which increase in yield was 10.20 q/ha. However, lowest increase in yield 5.10 q/ha was recorded in plots treated with chlorpyrifos @ 1000 ml/ha. On the basis of increase in grain yield over control, chlorantraniliprole @ 180 ml/ha was found to be the most effective treatment followed by chlorantraniliprole @ 150 ml/ha for the control of yellow stem borer.

It is evident from the data that all the treatments were effective in controlling yellow stem borer infestation at all time interval after first and second spray in comparison to control. The most effective treatment was chlorantraniliprole 20 SC @ 180 ml/ha followed by chlorantraniliprole 20 SC @ 150 ml/ha. The effectiveness of chlorantraniliprole against rice pest in recent time has been reported by Mange Ram (2012), Sarao and Kaur (2013) and Panda and Mishra (2014). Mahata et al. (2014) reported that chlorantraniliprole was effective against fruit and shoot borer in brinjal. Cartap hydrochloride 50 SP was found effective in present studies, which is in agreement with the results obtained by Sachan et al. (2006), Firake et al. (2010), Kulagod et al. (2011), Mishra et al. (2012) and Chormule et al. (2014). The efficacy of chemical insecticides like trizophos and chlorpyrifos against *S. incertulas* recorded in present studies are conformity with the findings of earlier studies conducted by Sachan et al. (2006), Dash and Mukherjee (2010) and Kulagod et al. (2011).

In present studies, higher grain yield was recorded in the treatment chlorantraniliprole @ 180 ml/ha which is in agreement with the finding of Mange Ram (2012) and Sarao and Kaur (2013). The higher grain yield was also recorded with the treatment cartap hydrochloride @ 1000 g/ha, trizophos @ 1000 ml/ha and chlorpyrifos @ 1000 ml/ha as compare to control in present studies are in conformity with the finding of Mange Ram (2012) and Mishra et al. (2012). From the present study, it has been concluded that chlorantraniliprole 20 SC @ 180 ml/ha can be recommended for the management of yellow stem borer in rice.

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