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BIO-EFFICACY OF CHLORANTRANILIPROLE 625 g/L FS (LUMIVIA) AGAINST SPOTTED STEM BORER, *CHILO PARTELLUS* INFESTING MAIZE

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ABSTRACT

A field experiment was conducted to check the bio-efficacy of different doses of Chlorantraniliprole 625 G/L FS (Lumivia) against stem borer, *Chilo partellus* infesting maize during *Kharif* and *Rabi* seasons of 2018-19 at Main Agricultural Research Station, University of Agricultural Sciences, Raichur. Results revealed that, Chlorantraniliprole 625 g/L FS @ 3.2 ml/kg seed (1.00 and 1.75 % dead heart during *kharif* and *rabi* 2018-19, respectively) and Chlorantraniliprole 625 g/L FS @ 2.56 ml/kg (1.87 and 2.87 % dead heart during *kharif* and *rabi* 2018-19, respectively) as seed treatment in maize were found to be optimum and effective in reducing per cent dead hearts due to *chilo partellus* up to 28 DAS and recorded higher grain yield.
***Keywords* :** Bio-efficacy, Chlorantraniliprole 625 G/L FS (Lumivia), Maize, *Chilo partellus*, Deadheart

Introduction

Maize (*Zea mays* L.) is a globally significant cereal crop that plays a central role in food, feed and industrial sectors. Maize is referred to as the "Queen of Cereals" worldwide due to its high genetic yield potential among all cereals (Manjanagouda and Kalyanamurthy, 2018). It is the third most important cereal after wheat and rice, both in terms of area and production. Originating from Central America, maize is now cultivated in over 160 countries across tropical, subtropical and temperate zones. Globally, the United States, China, Brazil, Argentina and India are the leading producers (Shiferaw *et al*., 2011).

In India, maize occupies approximately 11.24 million hectares with a production of around 37.67 million tonnes and average productivity of 3.40 tonnes per hectare (Anon., 2023). The crop is grown during both the *kharif* and *rabi* seasons, with maximum area under cultivation in states like Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh (Singh and Singh, 2020). Due to its adaptability, high yield potential and multiple uses-including food, fodder, starch, ethanol and oil-maize is gaining popularity among farmers, particularly in rainfed and irrigated farming systems (Haque *et al*., 2018).

Despite its economic importance, maize production is heavily constrained by several biotic stresses, particularly insect pests. Among these, the spotted stem borer, *Chilo partellus* (Swinhoe), is a major lepidopteran pest causing severe yield losses, especially in Asia and sub-Saharan Africa (Kumar *et al*., 2020). This pest infests maize during the early vegetative stage and bores into the stem, resulting in dead heart symptoms and reduced plant vigor. Initially, the first three larval instars consume by scraping across the leaf whorls of developing plants, resulting in symptoms that resemble "window-panning" and "pinholes." The mature larvae then tunnel within the central shoot, producing "dead hearts" in cases of severe infestation and causing the plant to die completely (Reyes, 1987; Neupane *et al*., 2022). Yield losses due to *C. partellus* can range from 25 to 40 per cent depending on pest population density and crop phenological stage at infestation (Kfir *et al*., 2002 and Khan *et al*., 2015). Properly timed foliar sprays using effective insecticides help minimize larval populations and protect plant growth, thereby preserving yield potential (Reddy *et al*., 2021). As an internal feeder, *C. partellus* must be controlled by applying effective pesticides with various modes of action at the right crop stage. With this background, present study was conducted to evaluate the bioefficacy of different doses of Chlorantraniliprole 625 G/L FS (Lumivia) against stem borer, *C. partellus* infesting maize.

Materials and Methods

Present investigation on bioefficacy of Chlorantraniliprole 625 G/L FS (Lumivia) against spotted stem borer, *Chilo partellus* in Maize was conducted at Main Agricultural Research Station, UAS, Raichur during *kharif* and *rabi* 2018-19. Experiment was laid out in Randomized Block Design consisting of six treatments and four replications. The required quantity of Chlorantraniliprole 625 g/L FS added in water to make 15 ml slurry sufficient to treat one kg of seed. Slurry was applied onto seeds of Maize hybrid Ganga kaveri-3059 and thoroughly mixed to ensure uniform coating on the seeds. The treated seeds were kept in shade for proper drying and dried seeds were used for sowing in field as per trial layout in plots of 8.4 m x 6.0 m with 60 x 20 cm spacing. Application of Carbofuran 3 G granules was carried out as per the treatment details in furrows at the time of sowing. All the crop management practice was done as per standard package of practices (Anon., 2020) including the control of non-target insect and diseases through foliar or other standard practices.

Observations on number of dead hearts were recorded at 14, 21, 29 and 35 days after sowing (DAS) on randomly selected 5 rows of 5 m each from trail plots. The number of damaged plants and healthy plants were counted to workout per cent dead heart infestation on maize. Then the data was subjected to statistical analysis after arcsine transformation from the original values.

Results and Discussion

Kharif 2018

Chlorantraniliprole 625 g/L FS (Lumivia) @ 3.20 ml/ha has significantly recorded lowest dead heart (0.25 %) with 95.00 per cent reduction over the control, followed by Chlorantraniliprole 625 g/L FS (Lumivia) @ 2.56 ml/ha (0.75 %) and 1.92 ml/ha (0.75) and both were on par at 14 DAS with 85.00 per cent reduction over the control. The lowest dosage of Chlorantraniliprole 625 g/L FS (Lumivia) @ 1.28 ml/ha recorded 1.50 per cent of dead hearts with reduction over the control of 70 per cent. Untreated control recorded highest infestation of 5.00 per cent dead heart at 14 days after sowing (Table 1). Similar trend was noticed at 21 and 28 days after sowing. At 35 days after sowing, per cent dead heart infestation in all doses of Chlorantraniliprole 625 g/L FS (Lumivia) was non-significant (Table 1).

The grain yield varied between 3427.75 to 3140.50 kg/ha. Treatment comprising of Chlorantraniliprole 625 g/L FS @ 3.20 ml/ha has recorded significantly highest grain yield (3427.75 kg/ha) and was on par with its next lower dosage treatment at 2.56 ml/ha (3423.50 kg/ha), followed by Chlorantraniliprole 625 g/L FS @ 1.92 ml/ha (3325.75 kg/ha). Untreated control recorded the lowest yield of 3140.50 kg/ha (Table 1).

Rabi 2018-19

All the doses of Chlorantraniliprole 625 g/L FS (Lumivia) were significantly superior over the control in per cent dead heart infestation of maize crop. Among the different doses, Chlorantraniliprole 625 g/L FS (Lumivia) @ 3.20 ml/ha has recorded 0.50 per cent dead heart infestation with 80.00 per cent reduction over the control and it was on par with Chlorantraniliprole 625 g/L FS (Lumivia) @ 2.56 ml/ha (0.87 % dead heart with 65.20 % ROC) at 14 days after sowing. The lowest dosage of Chlorantraniliprole 625 g/L FS (Lumivia) @ 1.28 ml/ha recorded 2.00 per cent of dead heart with 20.00 per cent reduction over the control. Untreated control recorded highest infestation of 4.20 per cent dead heart at 14 days after sowing (Table 2). Similar trend was noticed at 21 and 28 days after sowing. At 35 days after sowing, per cent dead heart infestation in all doses of Chlorantraniliprole 625 g/L FS (Lumivia) was non-significant (Table 2).

Among different dose of Chlorantraniliprole 625 g/L FS as a seed treatment, the Chlorantraniliprole 625 g/L FS @ 3.20 ml/ha has recorded significantly highest yield (3458.50 kg/ha) and was on par with its next lower dosage treatment at 2.56 ml/ha (3451.50 kg/ha), followed by Chlorantraniliprole 625 g/L FS @ 1.92 ml/ha (3287.50). Untreated control recorded the lowest yield of 3226.50 kg/ha (Table 2).

Reports of Rani *et al.* (2018) are in agreement with the present results who affirmed that the insecticides chlorantraniliprole 0.4 % GR @ 10 kg ha^{-1} and chlorantraniliprole 18.5 SC @ 150 ml ha^{-1} were found on par with carbofuran 3G in reduction of leaf injury and dead hearts damage by maize stem borers. Findings of Devananda *et al.* (2018) also support present results in which Carbofuran 3 G @ 0.3 kg a.i. ha^{-1}, Spinosad 45 SC @ 0.002 % and Chlorantraniliprole 18.5 SC @ 0.006 % were found highly effective in reducing the larval population and dead heart and found on par to each other. Jindal *et al.*

(2017) reported that deadheart incidence was minimum in plots sprayed with flubendiamide 480 SC @ 50 ml/ha (1.5 %) and was at par with its lower dose i.e. @ 25 ml/ha (2.6 %) and chlorantraniliprole 18.5 SC @ 100 ml/ha (1.6 %).

Conclusion

Chlorantraniliprole 625 g/L FS @ 3.2 ml/kg seed and Chlorantraniliprole 625 g/L FS @ 2.56 ml/kg as seed treatment in maize were found to be an efficient way to increase grain yield and were effective in reducing per cent dead hearts due to *chilo partellus* in maize.

Table 1: Effect of Chlorantraniliprole 625 g/L FS against stem borer, *Chilo partellus* during *Kharif* 2018 (First season)

Sl. No	Treatments	Dosage (g or ml/ha)	Per cent dead hearts at							Yield (kg/ha)
			14 DAS	ROC (%)	21 DAS	ROC (%)	28 DAS	ROC (%)	35 DAS	
1	Chlorantraniliprole 625 g/L FS	1.28 ml	1.50 (6.98)	70.00	2.25 (8.61)	43.75	3.75 (11.09)	25.00	7.00 (15.34)	3142.25
2	Chlorantraniliprole 625 g/L FS	1.92 ml	0.75 (4.89)	85.00	1.62 (7.30)	59.50	3.12 (10.17)	37.60	6.75 (15.06)	3325.75
3	Chlorantraniliprole 625 g/L FS	2.56 ml	0.75 (4.89)	85.00	1.00 (5.49)	75.00	1.87 (7.85)	62.60	5.00 (12.92)	3423.50
4	Chlorantraniliprole 625 g/L FS	3.20 ml	0.25 (2.02)	95.00	0.50 (4.05)	87.50	1.00 (5.73)	80.00	6.00 (14.18)	3427.75
5	Carbofuran 3% CG	33,300 g	3.75 (11.15)	25.00	2.00 (8.12)	50.00	4.50 (12.23)	10.00	6.00 (14.18)	3210.50
6	Untreated control	-	5.00 (12.90)	-	4.00 (11.52)	-	5.00 (12.90)	-	6.75 (15.06)	3140.50
S. Em (±)			**0.57**		**0.45**		**0.37**		**-**	**8.08**
C.D (0.05)			**1.75**		**1.37**		**1.12**		**NS**	**24.26**
C.V (%)			**13.12**		**12.06**		**7.42**		**10.73**	**9.38**

DAS: Day after sowing; ROC: Reduction Over Control
Figures in parentheses are arcsine transformed values

Table 2: Effect of Chlorantraniliprole 625 g/L FS against stem borer, *Chilo partellus* during *Rabi* 2018-19 (Second season)

Sl. No	Treatments	Dosage (g or ml/ha)	Per cent dead hearts at							Yield (kg/ha)
			14 DAS	ROC (%)	21 DAS	ROC (%)	28 DAS	ROC (%)	35 DAS	
1	Chlorantraniliprole 625 g/L FS	1.28 ml	2.00 (8.09)	20.00	3.00 (9.90)	29.41	3.25 (10.36)	38.10	6.75 (15.06)	3165.00
2	Chlorantraniliprole 625 g/L FS	1.92 ml	1.75 (7.57)	30.00	2.25 (8.58)	47.05	3.20 (10.27)	39.04	6.50 (14.77)	3287.50
3	Chlorantraniliprole 625 g/L FS	2.56 ml	0.87 (5.31)	65.20	1.75 (7.52)	58.82	2.87 (9.68)	45.33	6.25 (14.48)	3451.50
4	Chlorantraniliprole 625 g/L FS	3.20 ml	0.50 (3.46)	80.00	0.90 (5.41)	78.80	1.75 (7.52)	66.66	6.25 (14.48)	3458.50
5	Carbofuran 3% CG	33,300 g	1.50 (6.98)	40.00	3.75 (11.14)	11.76	4.50 (12.14)	14.28	6.25 (14.48)	3209.25
6	Untreated control	-	4.20 (11.75)	-	4.25 (11.83)	-	5.25 (13.23)	-	7.50 (15.89)	3226.50
S. Em (±)			**0.66**		**0.49**		**0.62**		**-**	**9.49**
C.D (0.05)			**2.00**		**1.48**		**1.90**		**NS**	**28.49**
C.V (%)			**13.70**		**10.86**		**11.95**		**8.67**	**10.72**

DAS: Day after sowing; ROC: Reduction Over Control
Figures in parentheses are arcsine transformed values

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