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Bio-efficacy of Different Formulations of Chlorantraniliprole 0.53%+ Fipronil 0.8% GR Against Yellow Stem Borer of Rice

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ABSTRACT

The study was conducted during *rabi* (December, 2020–May, 2021), and *kharif* (July–December, 2021) at University Instructional Farm, UBKV, Pundibari, Cooch Behar, West Bengal, India with a new combination of insecticides Chlorantraniliprole 0.53% w/w and Fipronil 0.8% w/w GR with different formulations to evaluate the bio-efficacy of these combinations of insecticides against yellow stem borer (*Scirpophaga incertulas*). In this study three formulations of Chlorantraniliprole 0.53% w/w+Fipronil 0.8% w/w GR @ 5.63 kg ha^{-1}, @ 7.50 kg ha^{-1} and @ 9.38 kg ha^{-1} were used and Chlorantraniliprole 0.40% GR @ 1 kg ha^{-1}, Fipronil 0.3% GR @ 25 kg ha^{-1}, Cartap hydrochloride 4% GR @ 18.75 kg ha^{-1} and untreated control were evaluated against yellow stem borer in rice crop. The result suggested from the present investigation that Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50–9.38 kg ha^{-1} was found best and effective as well as at par with each other against rice yellow stem borer. It has been observed that Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} registered good yield, 4.81 t ha^{-1} and 4.72 t ha^{-1} which were on par with Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} i.e., 4.79 t ha^{-1} and 4.70 t ha^{-1} in two consecutive seasons i.e., *rabi*, 2020–21 and *kharif*, 2021 respectively Whereas, Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} found much suitable with effective, safe and favorable cost-benefit ratio. The study also showed that there was no significant difference in density of predators in treated and untreated plots.

KEYWORDS: Chlorantraniliprole, fipronil, management, rice, *Scirpophaga incertulus*

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1. INTRODUCTION

Yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is the main devastators, responsible for economic losses in rice crop under local conditions (Kumar et al., 2012). It is a serious pest species of rice throughout the orients and abundant both on lowland rice and upland rice attacking young plant even in the nursery stage (Suresh et al., 2023). In India, nearly one hundred different insect species feed on rice, and about 18 of these are considered to be the main pests that significantly reduce rice yield (Jena et al., 2018; Katti, 2021). This crop is a warm, humid environment that allows lepidopteron insect pests like stem borers and rice leaf folders to survive and multiply. The presence of favourable abiotic and abiotic factors for its incidence and multiplication in rice makes it particularly harmful in a number of Asian countries (Sudharani et al., 2021). Rice plants are particularly vulnerable to yellow stem borer infestation during the tillering and flowering stages of their life cycle. *Scirpophaga incertulas* is the predominant species of yellow stem borer in India. The extent of yield losses in rice due to YSB has been estimated as 20–70% (Sharma et al., 2018). It is estimated that the yellow stem borer, *S. incertulas*, causes 1–19% yield losses in early planted rice crops and 38–80% yield losses in late transplanted rice crops (Singh et al., 2015). Yellow stem borer damages rice crops from seedlings to maturity, resulting in substantial crop losses of approximately 25–30% (Bhagat et al., 2022). Due to larval feeding and subsequent inter-nodal penetration, the presence of this pest in the field can be easily identified by 'dead heart' or 'white ear' in hills at the vegetative stage and panicles at the reproductive stage, respectively (Dutta and Roy, 2018, Sulagitti et.al., 2018).

Due to its hidden feeding behaviour, management of yellow stem borer has become challenging, leading to the use of only chemical control as a management strategy. Farmers commonly use insecticide to manage YSB (Sandhu and Dhaliwal, 2016). To develop a best chemical formulation against YSB it is required to evaluate the bio-efficacy of chemical due to changes in insect resistance levels. There is always room to conduct field trials to assess the efficacy of new chemicals due to changes in pest resistance levels and the discovery of new compounds with insecticidal properties. Chlorantraniliprole is well known for its systemic activity, acting as a muscle poison that obstructs the insect's feeding and movement. Chlorantraniliprole was safer to the natural enemies of rice insect pests (Jafar et al., 2013, Jaglan et al., 2023). Chormule et al. (2014) reported that chlorantraniliprole proved to be the best over other insecticides with reduced stem borer infestation and recorded higher yield. Fipronil, on the other hand, is a broad-spectrum insecticide that works as a neurotoxin and targets receptors in the insect's central nervous system. As antagonists to GABA (gammaamino-butyric acid) receptors, insecticidal pyrazoles poison the nervous system and kill insects by impairing the function of their central nervous systems (Cole et al., 1993). Fipronil works well against a variety of insect pests and is approved for use in a wide range of crops. It has been tested on more than 60 crops globally and against more than 250 insect pests (Anonymous, 2004). Both insecticides have unique modes of action and belong to different chemical classes, which can effectively control pests while limiting the emergence of resistance. In light of the aforementioned, the current study makes an effort to assess the effectiveness of combination of Fipronil and chlorantraniliprole insecticides against YSB in rice that has been transplanted.

2. MATERIALS AND METHODS

Experiment was carried out at University Instructional Farm, UBKV, Pundibari, Cooch Behar (West Bengal) during *rabi* (December, 2020–May, 2021) and *kharif* (July–December, 2021) to evaluate the efficacy of certain insecticides against rice stem borer in a Randomized block design with 7 treatments as listed under Table 1 with 3 replications.

Table 1: Treatment details for evaluation of bio efficacy

Tr. No.	Treatments	Dose (kg ha^{-1})	
		a.i	Formulation
T_1	Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	29.81+45	5.63
T_2	Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	39.75+60	7.50
T_3	Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	49.69+75	9.38
T_4	Chlorantraniliprole 0.40% GR	40	1.00
T_5	Fipronil 0.3% GR	75	25.00
T_6	Cartap hydrochloride 4% GR	750	18.75
T_7	Untreated control	-	-

Thirty days old seedlings of rice variety, Shatabdi (IET 4786) was transplanted with a spacing of 20×15 cm^2 in a plot of 5×5 m^2 and all agronomical practices recommended for the region were followed to raise the crop. The treatments were imposed when pest reached ETL level. Yellow stem borer (Dead hearts) observations were recorded before spray and at 7 and 14 days after first application and at 7, 14 and

21 days after second application, whereas white ears heads^{-1} observation were made at final grain filling stage (i.e., panicle emergence stage/approximately 20 days before harvest). The % incidence of damage made yellow stem borer was calculated by counting the number of damaged tillers and total number of tillers per hills. % reduction in dead hearts/ white ears over control were worked out at final observation for dead heart and white ear incidence. Dead heart and white ears number present per hills based on observation taken on ten randomly selected hills per plot. The data on % incidence of dead hearts/ white ears was calculated by below formula;

Stem borer incidence (%)=(No. of dead heart/White ears hill^{-1}/Total number of tillers/Panicles hill^{-1})×100

For natural enemies ten hills were selected randomly from each of the treated plots. Each hill was examined before application and 10 days after application to count the number of natural enemies. Two major predators were found as Dragonfly and Spiders. The data thus collected were subjected to analysis of variance after making necessary transformation.

Benefit-cost ratio was calculated by dividing the benefit in terms of increased crop value when an insecticide was used, by the cost of the insecticide treatment.

3. RESULTS AND DISCUSSION

3.1. Efficacy of chlorantraniliprole 0.53%+fipronil 0.8% GR against yellow stem borer on paddy

The efficacy of different treatment schedules of Chlorantraniliprole 0.53%+Fipronil 0.8% GR against Yellow stem borer of rice in form of dead heart and white ear has been presented in Table 2 and 3 during *rabi*, 2020–21 and *kharif*, 2021. During *rabi*, 2020–21 one day before spray dead heart % ranged from 6.20 to 6.64 per hills and showed non-significant difference among the treatments. Seven days after first application of insecticide minimum % of dead heart was recorded in Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (3.59 hills^{-1}) treatment followed by Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (3.75 hills^{-1}) which were at par with each other and superior to the rest of treatments. The remaining treatments Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 5.63 kg ha^{-1} (4.52 hills^{-1}), Chlorantraniliprole 0.40% GR @ 1.00 kg ha^{-1} (4.71 hills^{-1}), Cartap hydrochloride 4% GR @ 18.75 kg ha^{-1} (5.10 hills^{-1}) and Fipronil 0.3% GR @ 25.0 kg ha^{-1} (5.50 hills^{-1}) were superior to untreated control (7.65 hills^{-1}). The trend remained same for observations recorded during fourteen days after first application and seven, fourteen and twenty-one days after second spray i.e.,

Table 2: Bio-efficacy of chlorantraniliprole 0.53%+fipronil 0.8% GR and other insecticides against yellow stem borer (*Scirpophaga incertulas* Walk.) infesting rice during *rabi*, 2020–21 (Season I)

Treatments	Formulation dose (kg ha^{-1})	Pre-count	Mean incidence of dead heart (%) per hills					Reduction of dead heart (%)
			After first application		After second application			
			7 DAA	14 DAA	7 DAA	14 DAA	21 DAA	
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	5.63	6.35 (14.59)	4.52 (12.27)	4.87 (12.74)	3.66 (11.02)	3.47 (10.73)	3.15 (10.21)	80.96
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	7.50	6.50 (14.76)	3.75 (11.16)	3.98 (11.50)	1.80 (7.70)	1.25 (6.41)	0.72 (4.86)	95.65
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	9.38	6.20 (14.41)	3.59 (10.91)	3.84 (11.29)	1.66 (7.39)	1.12 (6.07)	0.61 (4.47)	96.31
Chlorantraniliprole 0.40% GR	1.00	6.45 (14.70)	4.71 (12.53)	5.13 (13.08)	3.98 (11.50)	3.83 (11.28)	3.55 (10.85)	78.54
Fipronil 0.3% GR	25.00	6.64 (14.92)	5.50 (13.55)	5.98 (14.15)	4.90 (12.78)	4.78 (12.62)	4.56 (12.32)	72.43
Cartap hydrochloride 4% GR	18.75	6.40 (14.65)	5.10 (13.04)	5.53 (13.59)	4.41 (12.11)	4.22 (11.85)	3.98 (11.50)	75.94
Untreated control	-	6.38 (14.62)	7.65 (16.05)	9.12 (17.57)	11.76 (20.04)	14.05 (22.00)	16.54 (23.98)	-
SEm±		0.10	0.12	0.15	0.17	0.20	0.22	-
CD (p=0.05)		NS	0.38	0.46	0.52	0.62	0.66	-

Table 2: Continue...

Treatments	Formulation dose (kg ha^{-1})	Mean incidence of white ear (%) hills^{-1}	Reduction of white ear (%)	Average grain yield (t ha^{-1})	Cost benefit ratio
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	5.63	4.75 (12.58)	75.74	4.03	1:0.62
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	7.50	1.48 (6.98)	92.44	4.79	1:1.02
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	9.38	1.36 (6.69)	93.05	4.81	1:1.01
Chlorantraniliprole 0.40% GR	1.00	5.35 (13.36)	72.68	3.87	1:0.55
Fipronil 0.3% GR	25.00	7.02 (15.35)	64.15	3.41	1:0.26
Cartap hydrochloride 4% GR	18.75	6.20 (14.41)	68.34	3.68	1:0.41
Untreated control	-	19.58 (26.24)	-	2.94	-
SEm±		0.24	-	0.11	-
CD (p=0.05)		0.74	-	0.33	-

DAA: Days after application; *Figures in the parentheses are angular transformed values; Market rates: Chlorantraniliprole 0.53%+Fipronil 0.8% GR: 400/- per kg.; Chlorantraniliprole 0.40% GR: 950/- per kg; Fipronil 0.3% GR: 100/- per kg; Cartap hydrochloride 4% GR: 148/- per kg; Price of rice grain: 18,880/- per ton; Cost of cultivation for rice: 24500/- per ha (approx.); Labour cost of insecticide application: 800/- spray per ha

Table 3: Bio-efficacy of chlorantraniliprole 0.53%+fipronil 0.8% GR and other insecticides against yellow stem borer (*Scirpophaga incertulas* Walk.) infesting rice during *kharif*, 2021 (Season II)

Treatments	Formulation dose (kg ha^{-1})	Pre-count	Mean incidence of dead heart (%) hills^{-1}					Reduction of dead heart (%)
			After first application		After second application			
			7 DAA	14 DAA	7 DAA	14 DAA	21 DAA	
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	5.63	5.62 (13.70)	4.10 (11.67)	4.44 (12.16)	3.32 (10.49)	3.15 (10.21)	2.85 (9.71)	80.89
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	7.50	5.40 (13.43)	3.33 (10.51)	3.57 (10.88)	1.55 (7.14)	1.08 (5.96)	0.56 (4.28)	96.25
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	9.38	5.48 (13.53)	3.18 (10.26)	3.45 (10.70)	1.42 (6.83)	0.96 (5.61)	0.44 (3.79)	97.05
Chlorantraniliprole 0.40% GR	1.00	5.77 (13.89)	4.32 (11.99)	4.72 (12.54)	3.69 (11.07)	3.52 (10.80)	3.30 (10.46)	77.88
Fipronil 0.3% GR	25.00	5.82 (13.95)	5.08 (13.02)	5.55 (13.62)	4.58 (12.35)	4.44 (12.16)	4.25 (11.89)	71.51
Cartap hydrochloride 4% GR	18.75	5.54 (13.60)	4.65 (12.44)	5.10 (13.04)	4.06 (11.62)	3.88 (11.35)	3.66 (11.02)	75.47
Untreated control	-	5.32 (13.33)	6.75 (15.05)	7.94 (16.36)	10.54 (18.93)	12.10 (22.34)	14.92 (22.70)	-
SEm±		0.08	0.10	0.13	0.15	0.18	0.20	-
CD (p=0.05)		NS	0.32	0.41	0.46	0.55	0.62	-

Table 3: Continue...

Treatments	Formulation dose (kg ha^{-1})	Mean incidence of white ear (%) hills^{-1}	Reduction of white ear (%)	Average grain yield (t ha^{-1})	Cost benefit ratio
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	5.63	4.54 (12.29)	74.92	3.96	1:0.64
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	7.50	1.32 (6.59)	92.71	4.70	1:1.03
Chlorantraniliprole 0.53% w/ w+fipronil 0.8% w/w GR	9.38	1.19 (6.25)	93.42	4.72	1:1.02
Chlorantraniliprole 0.40% GR	1.00	5.11 (13.06)	71.77	3.75	1:0.54
Fipronil 0.3% GR	25.00	6.80 (15.11)	62.43	3.36	1:0.30
Cartap hydrochloride 4% GR	18.75	5.95 (14.11)	67.13	3.57	1:0.41
Untreated control	-	18.10 (25.16)	-	2.82	-
SEm±		0.21	-	0.10	-
CD (p=0.05)		0.64	-	0.31	-

DAA: Days after application; *Figures in the parentheses are angular transformed values; Market rates: Chlorantraniliprole 0.53%+Fipronil 0.8% GR: 400/- per kg.; Chlorantraniliprole 0.40% GR: 950/- per kg; Fipronil 0.3% GR: 100/- per kg; Cartap hydrochloride 4% GR: 148/- per kg, Price of rice grain: 18,880/- per ton; Cost of cultivation for rice: 24500/- per ha (approx.); Labour cost of insecticide application: 800/- spray per ha

Twenty-one days after second spray Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (0.61 hills^{-1}) and Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (0.72 hills^{-1}) were at par with each other and maintained superiority in reducing the dead heart incidence compared to all other treatments. Untreated control recorded highest of 16.54 hills^{-1}. Similar trends were recorded for white ear observations during the seasons respectively.

During *kharif*, 2021 one day before spray dead heart % ranged from 5.32 to 5.82 hills^{-1} and showed non-significant difference among the treatments. Seven days after first application of insecticide minimum % of dead heart was recorded in Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (3.18 hills^{-1}) treatment followed by Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (3.33 hills^{-1}) which were at par with each other and superior to the rest of treatments. The remaining treatments Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 5.63 kg ha^{-1} (4.10 hills^{-1}), Chlorantraniliprole 0.40% GR @ 1.00 kg ha^{-1} (4.32 hills^{-1}), Cartap hydrochloride 4% GR @ 18.75 kg ha^{-1} (4.65 hills^{-1}) and Fipronil 0.3% GR @ 25.0 kg ha^{-1} (5.08 hills^{-1}) were superior to untreated control (6.75 hills^{-1}). The trend remained same for observations recorded during fourteen days after first application and seven, fourteen and twenty-one days after second spray i.e., Twenty-one days after second spray Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (0.44 hills^{-1}) and Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (0.56 hills^{-1}) were at par with each other and maintained superiority in reducing the dead heart incidence compared to all other treatments. Untreated control recorded highest of 14.92 hills^{-1}. Similar trends were recorded for white ear observations during the seasons respectively. Kumar et al. (2013) reported that fipronil has an outstanding long term insecticidal activity and is effective in controlling the stem borers and leaf folder at the doses tested (45 and 180 g a.i. ha^{-1}) on basmati rice throughout the cropping season. The management of yellow stem borer using, four foliar sprays of acephate 75SP @ 650 g ha^{-1} applied at 25, 50, 75 and 100 DAT proved to be the most effective in causing maximum reduction in the incidence of yellow stem borer in the Ranchi region of Jharkhand resulting in the highest grain yield of 37.80 q ha^{-1}. According to Meena et al. (2024) chlorantraniliprole 0.53% G 39.5 g a.i ha^{-1} was first best insecticidal treatment against yellow stem borer of rice Hurali et al. (2023) also found chlorantraniliprole 0.40% GR to check effectiveness against yellow stem borer but they found the mixture of chlorantraniliprole+fipronil GR @ 135.37 g a.i. ha^{-1} proved to be the most effective treatment (1.21% dead heart hill^{-1} and 1.01% leaf folder hill^{-1}) and the yield was maximum in the plot treated with chlorantraniliprole+fipronil GR at 135.37 g a.i. ha^{-1}.

It has been observed that Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} registered good yield, 4.81 t ha^{-1}

and 4.72 t ha^{-1} which were on par with Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} i.e., 4.79 t ha^{-1} and 4.70 t ha^{-1} in two consecutive seasons i.e., *rabi*, 2020–21 and *kharif*, 2021 respectively (Table 2 and 3). Thorat et al. (2023) reported that the highest grain and straw yield (5.15 and 7.75 t ha^{-1}) was recorded from the plot treated with chlorantraniliprole 18.5 SC, 30 g a.i. ha^{-1}. The control showed minimum grain yield among all the treatments i.e., 2.94 and 2.82 t ha^{-1} in both consecutive seasons respectively. Moreover, Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} and 9.38 kg ha^{-1} recorded high quality grains. According to Ghosh et al. (2020) Lambda Cyhalothrin 25% w/v+Chlorpyriphos 10% w/v (Ladex) @ 120 ml ha^{-1} recorded pooled of yield (4.29 t ha^{-1}) in rice during Rabi and Kharif season of 2017–18 and 2018 when sprayed against yellow stem borer.

Based on the yield data incremental cost benefit ratio of the different products were also calculated, which clearly indicate in *rabi*, 2020–21 the superiority of Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (1:1.02) followed by Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (1:1.01). Similarly, in *kharif*, 2021 the Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} (1:1.03) followed by Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 9.38 kg ha^{-1} (1:1.02). All other standard check treatments were found inferior to the above treatments in case of incremental cost benefit (C: B) ratio.

Study showed that all treated plots with Chlorantraniliprole 0.53%+Fipronil 0.8% GR were at par to each other in reference to the population of natural enemies when compared with other treatments (Table 4). There was no significant difference in density of predators in treated and untreated plots.

Table 4: Effect of different doses of chlorantraniliprole 0.53%+fipronil 0.8% GR on natural enemies of rice stem borer during both seasons (i.e., *rabi*, 2020–21 and *kharif*, 2021)

Treatments	Formulation dose (kg ha^{-1})	Dragonfly				Spiders			
		Rabi, 2020-21		*Kharif*, 2021		*Rabi*, 2020-21		*Kharif*, 2021	
		Pre-count	10 DAA	Pre-count	10 DAA	Pre-count	10 DAA	Pre-count	10 DAA
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	5.63	0.89 (1.18)	0.85 (1.16)	0.87 (1.17)	0.89 (1.18)	0.83 (1.15)	0.87 (1.17)	0.98 (1.22)	0.96 (1.21)
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	7.50	0.94 (1.20)	0.96 (1.21)	0.90 (1.18)	0.86 (1.16)	0.92 (1.19)	0.90 (1.18)	0.97 (1.21)	0.93 (1.20)
Chlorantraniliprole 0.53% w/w+fipronil 0.8% w/w GR	9.38	0.91 (1.19)	0.93 (1.20)	0.81 (1.14)	0.94 (1.20)	0.94 (1.20)	0.97 (1.21)	0.95 (1.20)	0.95 (1.20)
Chlorantraniliprole 0.40% GR	1.00	0.93 (1.20)	0.90 (1.18)	0.96 (1.21)	0.95 (1.20)	0.93 (1.20)	0.87 (1.17)	0.86 (1.17)	0.96 (1.21)
Fipronil 0.3% GR	25.00	0.90 (1.18)	0.93 (1.20)	0.93 (1.20)	0.90 (1.18)	0.85 (1.16)	0.90 (1.18)	0.81 (1.14)	0.87 (1.17)
Cartap hydrochloride 4% GR	18.75	0.85 (1.16)	0.83 (1.15)	0.97 (1.21)	0.92 (1.19)	0.88 (1.18)	0.91 (1.19)	0.84 (1.16)	0.86 (1.16)
Untreated control	-	0.90 (1.18)	0.94 (1.20)	0.88 (1.17)	0.83 (1.15)	0.94 (1.20)	0.97 (1.21)	0.95 (1.20)	0.92 (1.19)
SEm±		0.04	0.06	0.05	0.06	0.04	0.05	0.06	0.05
CD (p=0.05)		NS	NS	NS	NS	NS	NS	NS	NS

DAA: Days after application; Figures in the parentheses are square root transformed value of (X+0.5)

4. CONCLUSION

Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} and 9.38 kg ha^{-1} was found best and effective against stem borer Whereas, Chlorantraniliprole 0.53%+Fipronil 0.8% GR @ 7.50 kg ha^{-1} found much suitable with favorable cost-benefit ratio. Therefore, Chlorantraniliprole 0.53%+Fipronil 0.8% GR @7.50 kg ha^{-1} could be recommended for safe and economic use in rice for effective control of stem borer.

5. REFERENCE

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