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Evaluation of Chlorantraniliprole 150 g L^{-1}+Fipronil 225 g L^{-1} SC Combination against Yellow Stem Borer and Leaf Folder in Rice

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ABSTRACT

A field study was conducted during the *kharif,* 2023 and *rabi,* 2023–24 seasons at the Institutional Farm, Uttar Banga Krishi Viswavidyalaya, West Bengal, India to assess the efficacy of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC. The experiment employed a randomized block design comprising eight treatments with three replications. The treatments included Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 50, 75, 100, and 125 g a.i. ha^{-1}, Chlorantraniliprole 18.5% SC at 30 g a.i. ha^{-1}, Fipronil 5% SC at 75 g a.i. ha^{-1}, Chlorantraniliprole 9.30%+Lambda-cyhalothrin 4.60% ZC at 35 g a.i. ha^{-1}, and an untreated control. Observations focused on the % reduction in white ear heads, leaf damage, and effects on natural enemy populations per ten randomly selected hills in each plot. The findings indicated that Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC applied at 100 and 125 g a.i. ha^{-1} achieved significant pest control (>93% reduction). Regarding grain yield, the 125 g a.i. ha^{-1} dosage resulted in the highest yields (5.68 and 5.83 t ha^{-1} in the first and second seasons, respectively), comparable to the 100 g a.i. ha^{-1} dosage, which recorded 5.64 and 5.78 t ha^{-1}. However, the 100 g a.i. ha^{-1} dosage exhibited the highest benefit-cost ratio and minimal impact on natural enemy populations. This study concludes that Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 100 g a.i. ha^{-1} is an ecologically safe, economically viable, and effective option for pest management in the rice ecosystem.

KEYWORDS: Rice, yellow stem borer, leaf folder, Chlorantraniliprole, Fipronil

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1. INTRODUCTION

Oryza sativa L. (rice) remains the principal staple food for more than half of the global population and contributes substantially to caloric intake, nutritional security, and rural livelihoods, especially in Asia, Latin America, and some parts of Africa. In India during 2021–2022, rice was cultivated in 46.4 mha, yielding 130.29 mt of production (Anonymous, 2023). However, its cultivation is significantly hampered by environmental stress throughout the growth period. Of these, biotic stress accounts for 52% of the annual production loss, and insects are responsible for 21% of the total loss (Tenguri et al., 2023). Approximately 100 insect species are known to attack this crop, and 20 of these are frequently reported as significant pests (Rahaman and Stout, 2019). Among these, the yellow stem borer (YSB; *Scirpophaga incertulas* Walker) and rice leaf folder (*Cnaphalocrocis medinalis* Guenee) are the most destructive pests, causing substantial economic damage in India (Jaglan et al., 2024). YSB is a serious pest species throughout Asia and affects the nursery stage in both lowland and upland rice (Suresh et al., 2023). It has been estimated that YSB is responsible for 20–70% of the yield loss (Sharma et al., 2018). The symptoms of damage by YSB due to larval feeding and subsequent inter-nodal penetration; infestation in the field can be easily identified by 'dead heart' at the vegetative stage and 'white ear head' in the reproductive stage, respectively (Dutta and Roy, 2018). Similarly, the rice leaf folder, once considered a sporadic pest, has emerged as a recurrent and economically important defoliator in many rice ecosystems, which can significantly impair grain filling under high pest pressure (Patil et al., 2023; Meena and Kumar, 2024). Incidence of the pest begins at the flag leaf stage, persists until crop maturity, and may result in population outbreaks throughout India. (Singh et al., 2017; Saikia et al., 2019). Larvae feed within folded leaves, and scraping leads to whitish patches, reducing photosynthetic area and causing yield losses of approximately 30–80% (Kulgagod et al., 2011). The increasing frequency of pest outbreaks has been linked to intensified cropping, varietal shifts, fertilizer use patterns, and climatic variability (Tenguri et al., 2023). Although integrated pest management (IPM) promotes cultural, biological, and resistant cultivars, insecticides remain vital for rapid and dependable suppression of rice chewing pests (Anandhi et al., 2022). Continuous use of single active ingredients has intensified resistance, pest resurgence, and non-target risks (Rahaman and Stout, 2019; Hurali et al., 2023). The management of YSB in rice is complicated because of its concealed larval feeding habit within the stem and the increasing risk of insecticide resistance due to repeated use of single-mode insecticides (Kumar and Khan, 2005; Senthil-Nathan, 2013). Current studies have highlighted newer chemicals and mixture formulations with different modes of action to improve control and slow resistance development (Mehta et al., 2022; Jaglan et al., 2024). Insecticide mixtures, by combining different modes of action, can increase the effectiveness of pest control, aid in the management of resistance, and minimise environmental risks. Appropriate doses of insecticides reduce the chance of resistance development and offer broader protection against a variety of pests. Mixtures can also increase crop quality and yield by ensuring more thorough pest control. Therefore, the present study was undertaken to evaluate the bio-efficacy of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC against yellow stem borer and rice leaf folder, with an emphasis on pest reduction, yield improvement, and impact on natural enemies. The study seeks to provide evidence-based recommendations for the effective and ecologically compatible management of major lepidopteran pests in rice.

2. MATERIALS AND METHODS

A field study was conducted during the *kharif,* 2023 and *rabi,* 2023–24 seasons at Institutional Farm (88.00°E and 28.79°N), Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, India. The experiment was conducted in a randomised block design with three replications and eight treatments, as listed in Table 1. The rice variety Dhiren was transplanted at a spacing of 20×10 cm^2 in a plot of 5×5 m^2, and all packages of practices recommended for the region were followed to raise the crop. Treatments were applied when the pests reached their economic threshold levels (ETL).

2.1. Observations on yellow stem borer

Observations on white ear heads caused by yellow stem borer damage were recorded before spraying and at 14 and 21 days after spraying (DAS) per ten randomly selected hills in each plot. Ear head damage reduction percentage over the untreated control was calculated at 21 DAS by using standard formula:

Ear head damage (%)=(Number of damaged ear heads/Total number of ear heads)×100

2.2. Observations on rice leaf folder

Leaf folder damage was evaluated at 7, 14, and 21 DAS across ten randomly selected hills in each plot. The percentage reduction in leaf damage compared with the untreated control was calculated using a standard formula.

Leaf damage (%)=(Number of leaves damaged/Total number of leaves)×100

2.3. Natural enemies and yield

Natural enemy populations, particularly spiders and mirid bugs, were recorded before spraying and at 14 days after spraying from 10 randomly selected hills $plot^{-1}$. The

observed population was represented as the number per 10 hills. For each treatment plot, rice grain yield was recorded at the time of harvest, yield represented as tonnes per hectare (t ha^{-1}), net return, and benefit-cost ratio were calculated for each treatment.

Table 1: Treatment details

Sl. no.	Treatments	Dosage ha^{-1}	
		g a.i.	Formulation (ml)
T_1	Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC	50	133.33
T_2	Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC	75	200.00
T_3	Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC	100	266.66
T_4	Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC	125	333.33
T_5	Chlorantraniliprole 18.5% SC	30	150.00
T_6	Fipronil 5% SC	75	1500.00
T_7	Chlorantraniliprole 09.30%+ lambda-cyhalothrin 04.60 % ZC	35	250.00
T_8	Untreated control	-	-

3. RESULTS AND DISCUSSION

3.1. Yellow stem borer (Scirpophaga incertulas)

In the first season, the Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC treatment at 125 g a.i. ha^{-1} had the lowest ear head damage (1.26%), similar to the damage level at 100 g a.i. ha^{-1} (1.38%). This treatment reduced ear head damage by 93.97% compared to the untreated control, similar to the 100 g a.i. ha^{-1} treatment (93.40%) at 21 days after spraying. In the second season, the lowest ear head damage (0.82%) was again observed with Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 125 g a.i. ha^{-1}, comparable to the 100 g a.i. ha^{-1} treatment (1.08%), with the control showing the highest damage (17.90%). The 125 g a.i. ha^{-1} treatment reduced damage by 95.42%, whereas the 100 g a.i. ha^{-1} treatment achieved a reduction of 93.97% at 21 days after spraying as presented in Table 2. The present study is similar to earlier studies. Saritha et al. (2025) revealed that the treatment Chlorantraniliprole 5DT @ 70 g a.i. ha^{-1} recorded 79.35% reduction over the control. Dhanapati et al. (2024) reported that the formulation Chlorantraniliprole 0.53%+fipronil 0.8% GR @ 7.50 kg ha^{-1} and 9.38 kg ha^{-1} expressed high efficiency against stem borer, whereas Chlorantraniliprole 0.53%+fipronil 0.8% GR @ 7.50 kg ha^{-1} showed a better cost-benefit ratio. Mehta et al. (2022) revealed that among the evaluated insecticide formulations, Chlorantraniliprole 18.5% SC showed lower dead heart incidence. Katel et al. (2023) reported that the Chlorantraniliprole 18.5 SC was most effective in minimizing dead heart symptoms, reducing damage from 5.93% to 4.46%, and lowering white ear heads from 7.56% to 2.5%. Saikia et al. (2024) revealed that the lowest infestation percentage of yellow stem borer (2.10%) and white ear head (0.33%) was observed in Chlorantraniliprole 18.5 SC treated plots. Similarly,

Table 2: Efficacy of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC against ear head damage (% white ear) caused by yellow stem borer, *Scirpophaga incertulas* in rice during the *kharif,* 2023 and *rabi,* 2023–24

Sl. No.	Dosage ha^{-1}		Ear head damage (%)							
			Kharif, 2023				*Rabi,* 2023–24			
	g a.i.	Formulation (ml)	Before spray	14 DAS	21 DAS	ROC (%)	Before spray	14 DAS	21 DAS	ROC (%)
T_1	50	133.33	0.00 (0.00)	1.64 (7.37)	3.78 (11.20)	81.91	0.00 (0.00)	1.36 (6.63)	3.21 (10.32)	82.07
T_2	75	200.00	0.00 (0.00)	1.07 (5.84)	2.55 (9.17)	87.80	0.00 (0.00)	1.00 (5.67)	1.79 (7.64)	90.00
T_3	100	266.66	0.00 (0.00)	0.55 (3.48)	1.38 (6.67)	93.40	0.00 (0.00)	0.50 (3.32)	1.08 (5.87)	93.97
T_4	125	333.33	0.00 (0.00)	0.49 (3.29)	1.26 (6.38)	93.97	0.00 (0.00)	0.27 (1.72)	0.82 (5.19)	95.42
T_5	30	150.00	0.00 (0.00)	1.53 (7.12)	3.62 (10.96)	82.68	0.00 (0.00)	1.12 (6.00)	3.06 (10.08)	82.91
T_6	75	1500.00	0.00 (0.00)	2.68 (9.40)	6.01 (14.18)	71.24	0.00 (0.00)	2.17 (8.44)	4.97 (12.88)	72.23
T_7	35	250.00	0.00 (0.00)	2.59 (9.24)	5.79 (13.92)	72.30	0.00 (0.00)	1.96 (8.00)	4.75 (12.59)	73.46
T_8	-	-	0.00 (0.00)	9.78 (18.23)	20.90 (27.20)	-	0.00 (0.00)	8.56 (17.01)	17.90 (25.03)	-
SEm±	-	-	0.00	0.77	0.42	-	0.00	0.70	0.35	-
(p=0.05)	-	-	0.00	2.33	1.28	-	0.00	2.13	1.05	-

DAS: Days after spray; ROC: Reduction over untreated control @ 21 das, figures in parenthesis are arcsine transformed values

the effectiveness of Chlorantraniliprole 18.5 SC @ 150 ml ha^{-1} against rice stem borer and increasing grain yield, Chlorantraniliprole (Ferterra) @ 40 g a.i. ha^{-1} dramatically decreased dead heart and white ear head damage in rice, which had been documented by Sarao and Kaur (2014).

3.2. Rice leaf folder (Cnaphalocrocis medinalis)

The formulation with 125 g a.i. ha^{-1} of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC showed the least amount of leaf damage (0.96%) in the *kharif,* 2023 at 21 days after spraying. This damage level was comparable to that observed with the 100 g a. i. ha^{-1} treatment (1.04%). The control showed the highest leaf damage (15.44%). The treatment with 125 g a.i. ha^{-1} reduced leaf damage by 93.78% compared to the untreated control, similar to the 100 g a.i. ha^{-1} treatment (93.26%). In *rabi* 2023–24, the lowest leaf damage (0.78%) was again observed with Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 125 g a.i. ha^{-1}, comparable to the 100 g a.i. ha^{-1} treatment (0.88%), with the control showing the highest damage (14.87%). The 125 g a.i. ha^{-1} treatment reduced damage by 94.75%, while the 100 g a.i. ha^{-1} treatment achieved a reduction of 94.08% at 21 days after spraying as shown in Table 3. Saritha et al. (2025) reported that Chlorantraniliprole formulations significantly reduced leaf folder infestation and increased crop protection efficiency in rice ecosystems. Singh et al. (2024) revealed that Chlorantraniliprole 18.5 SC was effective against leaf folder, resulting in 6.46 %infestation. Similarly, Fipronil 5 SC also showed a 7.22% infestation. Patil et al. (2023) stated that Chlorantraniliprole 625 g l^{-1} FS was efficient against yellow stem borer and leaf folder in both hybrid rice (28P67) and conventional rice (CR Dhan 304). Similarly, the highest yield (for both hybrid and variety rice) was obtained when treating with 75 g a.i. ha^{-1} of Chlorantraniliprole. Reddy et al. (2023) analysed that the treatment of Chlorantraniliprole 0.4% GR was superior to control by reducing the incidence of leaf folder (1.56%). The incidence of YSB and leaf folder was effectively checked with Chlorantraniliprole+Fipronil GR @ 135.37 g a.i. ha^{-1} found to be the most effective treatment (1.21% dead heart $hill^{-1}$ and 1.01% leaf folder $hill^{-1}$), and recorded the maximum yield (71.95 q ha^{-1}) compared to the control (33.89 q ha^{-1}), while being safe to natural enemies (Hurali et al., 2023). Meena et al. (2026) reported that the combination of Chlorantraniliprole 18.5%

Table 3: Efficacy of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC against leaf damage caused by rice leaf folder, *Cnaphalocrocis medinalis* in rice

Sl. No.	Dosage ha^{-1}		Leaf damage (%)									
			Kharif, 2023					*Rabi,* 2023–24				
	g a.i.	Formulation (ml)	Before spray	7 DAS	14 DAS	21 DAS	ROC (%)	before spray	7 DAS	14 DAS	21 DAS	ROC (%)
T_1	50	133.33	16.11 (23.66)	3.56 (10.87)	4.11 (11.69)	3.72 (11.11)	75.91	13.55 (21.54)	3.00 (9.96)	3.78 (11.20)	3.50 (10.75)	76.46
T_2	75	200	14.39 (22.28)	2.12 (8.37)	2.57 (9.22)	2.26 (8.63)	85.36	14.83 (22.60)	1.67 (7.40)	2.32 (8.75)	2.00 (8.13)	86.55
T_3	100	266.66	15.27 (22.98)	0.72 (4.81)	1.22 (6.35)	1.04 (5.80)	93.26	14.43 (22.26)	0.47 (3.91)	0.94 (5.53)	0.88 (5.32)	94.08
T_4	125	333.33	15.75 (23.37)	0.55 (4.22)	1.00 (5.72)	0.96 (5.61)	93.78	13.86 (21.85)	0.31 (3.15)	0.83 (5.20)	0.78 (5.07)	94.75
T_5	30	150.00	14.43 (22.27)	3.33 (10.51)	3.94 (11.42)	3.51 (10.8)	77.27	13.65 (21.60)	2.80 (9.63)	3.56 (10.87)	3.25 (10.39)	78.14
T_6	75	1500.00	16.34 (23.82)	9.43 (17.88)	10.60 (19.00)	9.66 (18.10)	37.44	14.77 (22.57)	8.43 (16.86)	9.75 (18.19)	9.12 (17.57)	38.67
T_7	35	250.00	16.90 (24.22)	5.66 (13.76)	6.35 (14.59)	5.69 (13.79)	63.15	13.29 (21.36)	5.00 (12.92)	5.76 (13.88)	5.15 (13.11)	65.37
T_8	-	-	15.68 (23.31)	18.45 (25.44)	19.54 (26.23)	15.44 (23.13)	-	14.59 (22.45)	16.76 (24.17)	18.61 (25.55)	14.87 (22.67)	-
SEm±	-	-	-	0.34	0.27	0.40	-	-	0.36	0.47	0.45	-
(p=0.05)	-	-	ns	1.03	0.81	1.20	-	ns	1.09	1.41	1.38	-

DAS: Days after spray; ROC: Reduction over untreated control @ 21 das, figures in parenthesis are arcsine transformed values

SC+Fipronil 5% SC at 125 g a.i. ha^{-1} showed the lowest dead heart (5.65%) and white ear (4.07%) incidences, with the highest grain yield (4.63 t ha^{-1}). Meena and Kumar (2024) said that Chlorantraniliprole 0.53% G @ 39.75 g a.i ha^{-1} showed high efficacy against YSB and leaf folder in rice.

During the *kharif,* 2023, the highest grain yield was recorded with Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 125 g a.i. ha^{-1} (5.68 t ha^{-1}), which was comparable to Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 100 g a.i. ha^{-1} (5.64 t ha^{-1}), while the control had the lowest yield (3.33 t ha^{-1}). In *rabi* (2023–24), the highest yield was again with Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 125 g a.i. ha^{-1} (5.83 t ha^{-1}), comparable to Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 100 g a.i. ha^{-1} (5.78 t ha^{-1}), with the lowest yield in the control (3.48 t ha^{-1}). Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC at 100 g a.i. ha^{-1} had the highest benefit-cost ratio in both seasons, at 1.76 and 1.92, respectively as presented in Table 4. Saikia et al. (2024) found that Chlorantraniliprole 18.5 SC recorded the lowest infestation percentage of rice leaf folders at 7 DAS (3.40%) and 14 DAS (3.53%), along with a yield of 5.83 t ha^{-1}. Chanu and Sontakke (2015) observed that Rynaxypyr 0.4 G and 18.5SC at 50 g a.i. ha^{-1} significantly reduced leaf folder damage by 80.27% and 86.12% over the control, recording higher grain yields of 51 and 55 q ha^{-1}, respectively. Jaglan et al. (2023) stated that broadcast application of Chlorantraniliprole 0.4% GR @ 40 g a.i. ha^{-1} at the tillering stage was found effective against rice yellow stem borer and leaf folder infestation with increased grain yield. Chlorantraniliprole 0.4% GR @ 40 g a.i. ha^{-1} was also safer for the natural enemies of the rice ecosystem. From Table 5, it was inferred that no significant difference between the treatments, including the control, was observed with respect to the population of mirid bugs and spiders recorded during both the first and second season experiments. Similarly, The present findings are consistent with Rana et al. (2017) who reported that both Chlorantraniliprole 0.4% GR and Chlorantraniliprole 18.5 SC were relatively safe to predatory fauna, maintaining higher predator populations (1.62 and 2.17 hill^{-1}) than most

Table 4: Effect of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC on yield of rice

Sl. No.	Dosage ha^{-1}		yield (t ha^{-1})		Benefit cost ratio	
	g a.i.	Formulation (ml)	*Kharif,* 2023	*Rabi,* 2023–24	*Kharif,* 2023	*Rabi,* 2023–24
T_1	50	133.33	4.95	5.06	1.49	1.62
T_2	75	200.00	5.43	5.56	1.69	1.84
T_3	100	266.66	5.64	5.78	1.76	1.92
T_4	125	333.33	5.68	5.83	1.75	1.91
T_5	30	150.00	5.09	5.22	1.48	1.62
T_6	75	1500.00	4.02	4.21	1.00	1.16
T_7	35	250.00	4.56	4.68	1.22	1.35
T_8	-	-	3.33	3.48	0.74	0.88
SEm±			0.07	0.06		
(p=0.05)			0.20	0.18		

Table 5: Efficacy of Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC against spiders' and mirid bugs population in rice during *kharif*, 2023 and *rabi*, 2023–24

Sl. No.	dosage ha^{-1}		*Kharif*, 2023				*Rabi*, 2023–24			
			Spiders 10 hills^{-1}		Mirid bug 10 hills^{-1}		Spiders 10 hills^{-1}		Mirid bug 10 hills^{-1}	
	g a.i.	Formulation (ml)	before spray	14 das	before spray	14 das	before spray	14 das	before spray	14 das
T_1	50	133.33	10.33 (3.37)	12.33 (3.65)	22.67 (4.86)	21.67 (4.74)	12.00 (3.59)	13.67 (3.81)	23.00 (4.90)	24.00 (5.00)
T_2	75	200.00	12.67 (3.69)	11.67 (3.55)	23.33 (4.93)	23.00 (4.89)	11.33 (3.51)	12.00 (3.60)	22.00 (4.79)	22.67 (4.86)
T_3	100	266.66	11.00 (3.46)	12.00 (3.60)	22.00 (4.79)	22.67 (4.86)	10.67 (3.38)	11.33 (3.51)	23.33 (4.92)	23.00 (4.89)

Table 5: Continue....

Sl. No.	dosage ha^{-1}		*Kharif*, 2023				*Rabi*, 2023–24			
			Spiders 10 hills^{-1}		Mirid bug 10 hills^{-1}		Spiders 10 hills^{-1}		Mirid bug 10 hills^{-1}	
	g a.i.	Formulation (ml)	Before spray	14 DAS	Before spray	14 DAS	Before spray	14 DAS	Before spray	14 DAS
T_4	125	333.33	12.00 (3.60)	13.00 (3.74)	23.67 (4.96)	24.00 (5.00)	12.33 (3.64)	13.00 (3.74)	22.67 (4.86)	23.67 (4.96)
T_5	30	150.00	11.33 (3.49)	11.33 (3.49)	21.67 (4.76)	23.00 (4.90)	11.00 (3.46)	12.67 (3.69)	23.00 (4.93)	22.33 (4.83)
T_6	75	1500.00	10.67 (3.40)	12.00 (3.59)	22.00 (4.79)	22.33 (4.83)	10.67 (3.41)	13.33 (3.78)	21.67 (4.76)	24.67 (5.06)
T_7	35	250.00	11.00 (3.46)	10.67 (3.41)	22.67 (4.86)	24.00 (5.00)	12.00 (3.59)	14.00 (3.87)	22.33 (4.83)	25.00 (5.10)
T_8	-	-	12.33 (3.64)	12.67 (3.69)	23.33 (4.93)	22.67 (4.85)	11.33 (3.51)	12.67 (3.69)	22.00 (4.79)	22.33 (4.81)
SEm±	-	-	-	-	-	-	-	-	-	-
(p=0.05)	-	-	NS	NS	NS	NS	NS	NS	NS	NS

DAS: Days after spray; ROC: Reduction over untreated control @ 21 das, figures in parenthesis are arcsine transformed values

insecticidal treatments and thereby supporting natural enemy conservation.

4. CONCLUSION

Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC applied at 125 g a.i. ha^{-1} was significantly superior to other treatments in controlling yellow stem borer and rice leaf folder across both seasons, resulting in a higher grain yield than other treatments. Since 100 g a.i. ha^{-1} showed a favourable yield with a high benefit-cost ratio, Chlorantraniliprole 150 g l^{-1}+Fipronil 225 g l^{-1} SC @ 100 g a.i. ha^{-1} was recommended against these pests.

5. FURTHER RESEARCH

Further studies can be conducted at the field level, including residue analysis and resistance monitoring, to assess long-term insecticide sustainability.

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7. REFERENCE

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