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Performance of different insecticides against *Chilo partellus* infestation under field conditions

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Abstract

The investigation conducted at RVSKVV, Gwalior, during *Kharif* 2024 and 2025 revealed that, among the ten treatments, Chlorantraniliprole 18.5% SC with 11.11% is most effective followed by Flubendiamide 20% WG with 13.89% against dead heart damage caused by sorghum spotted stem borer. And the percentage of reduction over control was maximum in Chlorantraniliprole 18.5% SC with 76.88% followed by Flubendiamide 20% WG with 71.10%.

Keywords: Dead heart, efficacy, Chlorantraniliprole, Flubendiamide, *Chilo partellus*

Introduction

Trailing wheat, rice, maize and barley in terms of production and cultivated area, sorghum (*Sorghum bicolor* (L.) Moench) is a significant cereal crop in the globe (Ahmed *et al.*, 2000)^[1]. The crop is highly prized for its ability to withstand drought, use water efficiently, adapt to marginal habitats, and produce a lot of biomasses, which makes it deal for sub-Saharan Africa's semi-arid regions (Wortmann *et al.*, 2009; Ogbaga *et al.*, 2014)^[19, 12]. Sorghum is the second most important cereal in Uganda, after maize, and it plays a significant role in the production of food and animal feed (Wortmann *et al.*, 2009)^[19]. Because its stalks, leaves and grains can be used to produce liquid fuels like bioethanol and bio-oil, gaseous fuels like biohydrogen, biogas and syngas and solid products like biochar, sorghum has significant potential as a bioenergy crop in addition to its use as a food and fodder crop (Stamenkovic *et al.*, 2020)^[17]. Its economic significance and variety of uses as a C₄ crop are further enhanced by the widespread use of its biomass as animal feed (Ahmed *et al.*, 2000; Xin *et al.*, 2021)^[1, 20]. Sorghum productivity is limited by a number of biotic and abiotic stressors that can result in significant yield losses despite its versatility and numerous applications (Perumal *et al.*, 2018; Fakrudin *et al.*, 2021)^[13, 4].

Pest infestations and plant diseases are two of the most significant biotic limitations because they can negatively impact crop production and development at various stages. Sorghum is infested by a number of insect pests, including as shoot fly, stem borer, fall armyworm, aphids, ear head bugs etc. Because their larvae burrow into the stem and eat internally, damaging vascular tissues and weakening the plant, stem borers are regarded as serious pests. While an attack during the reproductive stage might result in panicle damage, poor grain growth and decreased grain yield, and infestation during the vegetative stage may provide typical signs like shot holes and dead hearts (van Rensburg and Flett 2010; Mula *et al.* 2011)^[18, 10].

Materials and Methods

A sorghum genotype N-15 was sown in a plot size of 2.7 m x 3 m with a spacing of 45 cm x 15 cm. A total of ten treatments (Table 1) were duplicated thrice each. The spraying was done with the help of lever operated knapsack sprayer. Total two sprays were given for the management of spotted stem borer. Spraying was initiated at 45 DAE. The second spray was applied 15 days after first spray. Observations were taken at one day before spraying and 3, 7 and 14 days after spraying. The incidence of spotted stem borer (per cent dead hearts) was assessed on ten randomly selected plants in the plot at each observation interval.

Percent dead hearts = $\frac{\text{No. of plants with dead hearts}}{\text{Total no. of plants observed}} \times 100$

Table 1: Treatment details

Tr. No.	Treatment Details	Dose (ml or g/ha)
T ₁	Chlorantraniliprole18.5% SC @ 30 a.i/ha	150 ml
T ₂	Quinalphos 25% EC @ 325 a.i/ha	1300 ml
T ₃	Carbofuran3%CG @ 250 a.i/ha	8000 g
T ₄	Chlorpyrifos20%EC @ 250 a.i/ha	1250 ml
T ₅	Phosalone35%EC @ 400 a.i/ha	1000 g
T ₆	Acephate75%SP @ 500 a.i/ha	500 g
T ₇	Imidacloprid 17.8% SL @ 20 a.i/ha	125 ml
T ₈	Flonicamid 50% WG @ 75 a.i/ha	150 g
T ₉	Flubendiamide 20% WG @ 25 a.i/ha	125 g
T ₁₀	Control	-

Results and Discussion

The pre-treatment mean for dead heart damage due to spotted stem borer in the experimental plots ranged from 31.67% to 38.33%. After first spray, minimum and significantly less percent dead heart and reduction over control was recorded in T₁ (16.67% and 62.50%), T₉ (18.89% and 57.50%) and T₃ (24.44% and 44.99%). Next effective was T₄ (26.67% and 39.99%), T₂ (27.78% and 37.49%), T₅ (30.56% and 31.24%), T₆ (33.33% and 24.99%), T₇ (35.56% and 19.99%) and T₈ (37.22% and 16.24%). After second spray, minimum and significantly less percent dead heart and reduction over control was recorded in T₁ (5.56% and 89.25%), T₉ (8.89% and 82.82%) and T₃ (11.67% and 77.42%). Next effective was T₄ (16.67% and 67.74%), T₂ (21.11% and 59.14%), T₅ (21.67% and 58.07%), T₆ (23.89% and 53.77%), T₇ (28.89% and 44.09%) and T₈ (30.56% and 40.86%). Mean of all the two sprays during Kharif 2024 and 2025, showed that minimum and significantly less percent dead heart was recorded in plots treated with T₁ (19.45%) (Table 2). While next best insecticides were T₉ (13.89%) and T₃ (18.06%). After that, the further effective treatments T₄ (21.67%), T₂ (24.44%),

T₅ (26.11%), T₆ (28.61%) and T₇ (32.22%). However, maximum and significantly higher percent dead heart was recorded in T₈ (33.89%). All the treatments were found significantly superior to control (48.06%). Data obtained on percent reduction of dead heart i.e., over control during Kharif 2024 and 2025 showed that the maximum reduction in per dead heart over control was recorded in T₁ (76.88%) followed by, T₉ (71.10%), T₃ (62.43%), T₄ (54.92%), T₂ (49.14%), T₅ (45.67%), T₆ (40.07%) and T₇ (32.95%). The minimum percent reduction was recorded in T₈ (29.49%). The data of overall mean efficacy of the different insecticidal treatments against spotted stem borer during 2024 and 2025 years of Kharif seasons, concluded that all the insecticides were significantly minimized the stem borer infestation as compared to control plot. From the current studies, observed that Chlorantraniliprole 18.5% SC is more potent against spotted stem borer with highest reduction percentage 76.88%. The results were comparable with Kumar *et al.* (2015) ^[7], who showed that Chlorantraniliprole 18.5% SC was efficient when compared to Chlorpyrifos 20 EC and Imidacloprid 75 FS. Devananda *et al.* (2018) ^[3] and Kumar and Jindal, 2015 ^[9], reported that the Chlorantraniliprole 18.5% SC was best in reducing spotted stem borer damage. The next best treatment is Flubendiamide 20% WG followed by Carbofuran 3% CG. The present investigation is coherent with Ramesh *et al.* (2023), who revealed that Flubendiamide 20% WG and Carbofuran 3% CG was efficient against *C. partellus*. In the same way, Kumar and Alam (2017) ^[8], who noted that the Flubendiamide 480 SC and Carbofuran 3% CG was effectively by recording minimum damage caused by stem borer in maize. The results are in line with studies made by Bhaskar (2022) ^[2], concluded that Flubendiamide 39.35 SC and Flonicamid 50 WG was superior to other insecticides. In addition, Kumar *et al.*, 2017 ^[8] and Sohail *et al.*, 2003 ^[16], who found that Carbofuran 3% CG was best against spotted stem borer. Similar results found by Jindal *et al.*, 2017 ^[5]; Roopika *et al.*, 2020 ^[15]; Munjaji, 2020 ^[11] and Rani *et al.*, 2018 ^[14].

Table 2: Impact of different insecticidal treatments on C. partellus -induced dead heart in sorghum during Kharif 2024 and 2025

Tr. No.	Treatment	Per cent dead heart caused by spotted stem borer										After two sprays mean	% ROC	
		PT	First spray					Second spray						
			3 DAS	7 DAS	14 DAS	Mean	% ROC	3 DAS	7 DAS	14 DAS	Mean			% ROC
T ₁	Chlorantraniliprole 18.5%SC	31.67 (34.15)*	20.00 (26.57)	16.67 (24.05)	13.33 (21.14)	16.67 (24.05)	62.50	8.33 (16.60)	5.00 (10.45)	3.33 (8.61)	5.56 (13.60)	89.25	11.11 (19.45)	76.88
T ₂	Quinalphos 25% EC	36.67 (36.93)	35.00 (36.27)	25.00 (30.00)	23.33 (28.86)	27.78 (31.80)	37.49	26.67 (31.07)	20.00 (26.45)	16.67 (24.05)	21.11 (27.35)	59.14	24.44 (29.63)	49.14
T ₃	Carbofuran 3% CG	36.67 (37.26)	31.67 (34.18)	23.33 (28.86)	18.33 (25.31)	24.44 (29.61)	44.99	15.00 (22.60)	11.67 (19.89)	8.33 (16.60)	11.67 (19.85)	77.42	18.06 (25.14)	62.43
T ₄	Chlorpyrifos 20% EC	31.67 (34.15)	31.67 (34.18)	26.67 (30.95)	21.67 (27.71)	26.67 (31.08)	39.99	20.00 (26.57)	16.67 (24.05)	13.33 (21.34)	16.67 (24.09)	67.74	21.67 (27.74)	54.92
T ₅	Phosalone 35% EC	38.33 (38.16)	35.00 (36.24)	31.67 (34.23)	25.00 (29.93)	30.56 (33.55)	31.24	25.00 (30.00)	21.67 (27.71)	18.33 (25.31)	21.67 (27.74)	58.07	26.11 (30.73)	45.67
T ₆	Acephate 75% SP	33.33 (35.22)	36.67 (37.20)	35.00 (36.13)	28.33 (32.14)	33.33 (35.26)	24.99	25.00 (30.00)	25.00 (29.93)	21.67 (27.71)	23.89 (29.25)	53.77	28.61 (32.33)	40.47
T ₇	Imidacloprid 17.8% SL	38.33 (38.16)	38.33 (38.24)	36.67 (37.26)	31.67 (34.23)	35.56 (36.60)	19.99	30.00 (33.16)	30.00 (33.16)	26.67 (31.07)	28.89 (32.50)	44.09	32.22 (34.58)	32.95
T ₈	Flonicamid 50% WG	33.33 (35.01)	38.33 (38.24)	36.67 (37.26)	36.67 (37.26)	37.22 (37.59)	16.24	35.00 (36.27)	31.67 (34.23)	25.00 (29.93)	30.56 (33.56)	40.86	33.89 (35.60)	29.49
T ₉	Flubendiamide 20% WG	36.67 (36.14)	23.33 (28.78)	20.00 (26.45)	13.33 (21.34)	18.89 (25.67)	57.50	10.00 (18.05)	10.00 (18.05)	6.67 (14.76)	8.89 (17.24)	82.80	13.89 (21.85)	71.10
T ₁₀	Control	36.67 (37.26)	43.33 (41.15)	43.33 (41.13)	46.67 (43.08)	44.44 (41.80)	-	48.33 (44.03)	51.67 (45.96)	55.00 (47.87)	51.67 (45.96)	-	48.06 (43.88)	-
S.E(m)±		3.71	1.35	2.03	1.46	1.01	-	1.50	1.87	1.87	0.81	-	0.64	-
CD at 5%		NS	4.01	6.02	4.33	3.00	-	4.45	5.56	5.57	2.41	-	1.91	-
CV		17.72	6.66	10.75	8.39	5.35	-	9.00	12.01	13.13	5.18	-	3.71	-

*Figures in parentheses are arc sine transformed values; PT = Pre-treatment; NS = non-significant; ROC = reduction over control

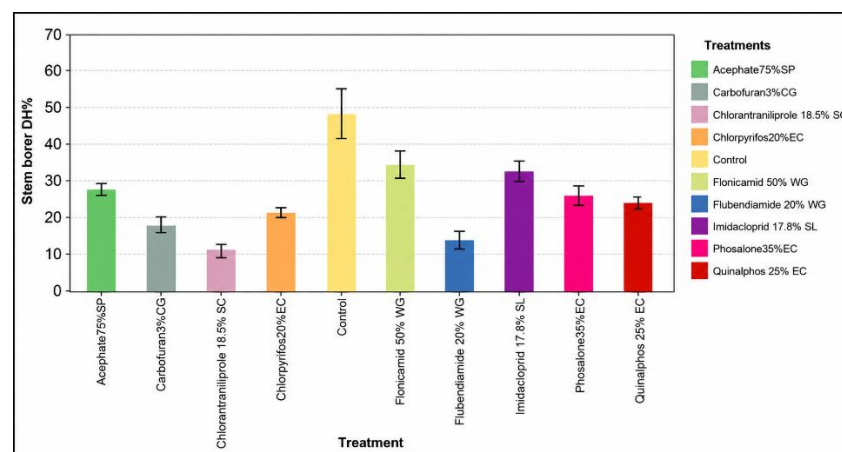


Fig 1: Impact of different insecticidal treatments on stem borer-induced dead heart in sorghum during Kharif 2024 and 2025

Declaration

The authors declare that they have no conflict of interests.

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