The Pharma Innovation Journal 2022; 11(7): 1820-1822

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 1820-1822

www.thepharmajournal.com
Received: 01-03-2022
Accepted: 07-06-2022

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Efficacy of different insecticides against larval population of *Spodoptera frugiperda on rabi* Jowar

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Abstract
Investigations were carried out to study the "Efficacy of different insecticides against larval population of *Spodoptera frugiperda on rabi* Jowar" at experimental farm of L. M. K college of agriculture, Sonsal-Hingangaon. Sorghum (*Sorghum bicolor*) is an important crop cultivated across the world, therefore management of fall armyworm is very important for better yield. Studies revealed that emamectin benzoate 5 SG (2.25 larva /10 plant) proved effective with minimum infestation of Fall armyworm and found at par with Spinetoram 11.7 SC (2.65 larva /10 plant) and Chlorantriniliprole 18.5 SC (3.22 larva /10 plant), Thimethoxam 12.6 + Lambda cyhalothrin 9.5 ZC (4.86 larva /10 plant), Indoxacarb 14.5 SC (5.50 larva /10 plant), Spinosad 45 SC (5.64 larva /10 plant) and Profenophos 50 EC (7.33 larva /10 plant) appeared as next better treatments in this respect respectively. Maximum infestation of Fall armyworm was recorded in water spray (19.10 larva /10 plant).

Keywords: Insecticides, larval, population, *Spodoptera frugiperda on rabi*

Introduction
Sorghum (*Sorghum bicolor*) is an important crop which ranks fifth among cultivated cereals across the world. As it is important food crop which completes food demand of humans as well as Livestocks. It has potential to yield under unexpected weather conditions. Sorghum is one of the host plants of fall armyworm and its infestation causes severe defoliation and seedling death which ultimately reduces crop production. Due to this it is necessary to manage the infestation of fall armyworm.

Material and Methods
Location of experiment
Investigations were carried out to study the "Efficacy of different insecticides against larval population of *Spodoptera frugiperda on rabi* Jowar" at experimental farm of L. M. K college of agriculture, Sonsal-Hingangaon.

Table 1: Treatment details

Tr. No.	Treatment	Formulation	Dose (ml or gm/ha)
T_1	Profenphos 50%	EC	750 ml
T_2	Indoxacarb 14.5%	SC	250 ml
T_3	Emamectin Benzoate 5%	SG	200 g
T_4	Spinosad 45%	SC	200 ml
T_5	Thimethoxam 12.6% + Lambda cyhalothrin 9.5%	ZC	125 ml
T_6	Spinetoram 11.7%	SC	150 ml
T_7	Chlorantraniliprole 18.5%	SC	125 ml
T_8	Water spray	--	--

Experimental details.
The details of experiments are given below

Experimental Design	Randomized block design
Season	*Rabi* 2021-22
Plot size	10 x 10 m2
Variety	Maldandi-35-1
Spacing between plants	60 x 30 cm^2

Methodology

Observations on Fall armyworm

Ten plants were randomly selected from each plot and total larval count per ten plant was taken. Pre-treatment observations were recorded one day before spray for Fall armyworm (*S. frugiperda*) (J.E. Smith). Then post-treatment observations were recorded on 14nd, 28th, and 42th days after application of insecticides for each spraying.

Result and discussion

Effect of insecticides on larval population of Fall armyworm *Spodoptera frugiperda* on *rabi* jowar after first spraying

The observations presented in table revealed that the pre count of Fall armyworm i.e. *S. frugiperda* was non significant showing even distribution of plant infestation before spraying.

The results regarding effect of different insecticides on plant infestation by *S. frugiperda* after spraying are given below.

After 1st spraying, all the insecticides were found significantly superior over water spray in reducing larval population of fall armyworm in *rabi jowar* after first application of insecticides. Emamectin benzoate 5 SG (3.40 larva /10 plant) recorded minimum larval population of Fall armyworm and it was at par with spinetoram 11.7 SC (3.42 larva /10 plant) and chlorantraniliprole 18.5 SC (3.45 larva /10 plant). Followed by thiamethoxam 12.6 + lambda cyhalothrin 9.5 ZC (6.00 larva /10 plant), indoxacarb 14.5 SC (6.70 larva /10 plant), spinosad 45 SC (6.85 larva /10 plant), profenophos 50EC (9.45 larva /10 plant). Water spray (18.77 larva /10 plant) was found least effective against Fall armyworm on *Rabi jowar* after 1st spraying.

Table 2: Cumulative effect of newer insecticides against *Spodoptera frugiperda* during *Rabi 2021-22*

Tr. No.	Treatment	Dose (ml or gm/ha)	Pre - count	No. of larvae / 10 plant			
				1st spray	2nd spray	3rd spray	Mean
T_1	Profenphos 50 EC	750 ml	16.90 (4.08)	9.45 (3.25)	7.30 (2.82)	5.23 (2.29)	7.33 (2.79)
T_2	Indoxacarb 14.5 SC	250 ml	18.12 (4.40)	6.70 (2.75)	6.39 (2.74)	3.42 (1.92)	5.50 (2.47)
T_3	Emamectin Benzoate 5 SG	200 g	17.50 (4.35)	3.40 (2.10)	2.06 (1.80)	1.30 (1.52)	2.25 (1.51)
T_4	Spinosad 45 SC	200 ml	18.70 (4.49)	6.85 (2.75)	5.60 (2.60)	4.48 (2.42)	5.64 (3.00)
T_5	Thiamethoxam 12.6 + Lambda cyhalothrin 9.5 ZC	125 ml	17.75 (4.38)	6.00 (2.44)	5.08 (2.25)	3.50 (1.87)	4.86 (2.19)
T_6	Spinetoram 11.7 SC	150 ml	16.60 (4.15)	3.42 (1.98)	2.70 (1.64)	1.82 (1.35)	2.65 (1.65)
T_7	Chlorantraniliprole 18.5 SC	125 ml	17.40 (4.31)	3.45 (1.92)	3.48 (2.10)	2.72 (1.65)	3.22 (2.04)
T_8	Water spray		17.00 (4.24)	18.77 (4.44)	21.99 (4.78)	16.55 (3.78)	19.10 (4.35)
SE (m)+			N/S	0.07	0.09	0.14	0.09
CD @ 5%				0.24	0.27	0.42	0.29
CV (%)				4.77	5.87	10.70	6.40

*Figure in parenthesis are square root transformed values.

Second spraying

The results after second spraying indicated that emamectin benzoate 5 SG (2.06 larva /10 plant) recorded minimum larval population infestation of Fall armyworm and it was at par with spinetoram 11.7 SC (2.70 larva /10 plant). The next best treatments were chlorantraniliprole 18.5 SC (3.48 larva /10 plant), thimethoxam 12.6 + lambda cyhalothrin 9.5 ZC (5.08 larva /10 plant), Spinosad 45 SC (5.60 larva /10 plant), indoxacarb 14.5 SC (6.39 larva /10 plant) and profenophos 50 EC (7.30 larva /10 plant) respectively. The highest infestation was recorded in water spray (21.99 larva /10 plant).

Third spraying

The results after the third spray showed that water spray (16.55 larva /10 plant) recorded maximum infestation whereas emamectin benzoate 5 SG (1.30 larva /10 plant) showed minimum larval infestation of Fall armyworm and was approximately equivalent to spinetoram 11.7 SC (1.82 larva /10 plant). Chlorantraniliprole 18.5 SC (2.72 larva /10 plant), Indoxacarb 14.5 SC (3.42 larva /10 plant), thimethoxam 12.6 + lambda cyhalothrin 9.5 ZC (3.50 larva /10 plant), Spinosad 45 SC (4.48 larva /10 plant), profenophos 50 EC (5.23 larva /10 plant) respectively was the next order of efficacy of the insecticidal treatments.

Mean

The cumulative mean data presented in Table showed that after spray with emamectin benzoate 5 SG (2.25 larva /10 plant) proved effective with minimum infestation of Fall armyworm and found at par with spinetoram 11.7 SC (2.65 larva /10 plant). Followed by Chlorantraniliprole 18.5 SC (3.22 larva /10 plant), thimethoxam 12.6 + lambda cyhalothrin 9.5 ZC (4.86 larva /10 plant), indoxacarb 14.5 SC (5.50 larva /10 plant), spinosad 45 SC (5.64 larva /10plant) and profenophos 50 EC (7.33 larva /10 plant) appeared as next better treatments in this respect respectively. Maximum infestation of Fall armyworm was recorded in water spray (19.10 larva / 10 plant).

The present finding are more or less parallel to the finding of other workers like Mallapur *et al.*, (2019) [10] they concluded that spinetoram recorded 98.13 percent reduction over control at seven days after treatment followed by emamectin benzoate and spinosad recording 96.26 per cent reduction while, thiamethoxam 0.25 WG and fipronil 0.5 SC were least effective (68.65 and 73.14 mortality, respectively). Hardke *et al.*, (2011b) [8] studied Fall armyworm mortality on treated diets with chlorantraniliprole, lambda cyhalothrin, spinetoram and flubendiamide were significantly higher (90.6 to 100 per cent) than non-treated control three days after treatment application.

Assefa (2018) [2] reported that use of chlorantraniliprole and cyantraniliprole as seed treatments in soya reduced the need for foliar sprays against FAW in soya. In laboratory tests, thiodicarb and clothianidin reduced the number of plants cut or insured by FAW.

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