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Efficacy of new molecules of insecticides against aphid, *Aphis gossypii* (Glover) in summer sesame**Mohanlal Pensiya, G. M. Parmar*, Asha C. Detroja and R. M. Vikani***Department Entomology, College of Agriculture, Junagadh Agriculture University, Junagadh, Gujarat-362001***Corresponding author – gmparmar@jau.in***Abstract**

Experiment was undertaken during 2021 at Instructional Farm, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh to determine the efficacy of new molecules of insecticides against aphid in summer sesame. The results showed that the seed treatment with (fipronil 40% + imidaclopride 40% WG) @ 5 g/kg + FS of afidopyropen 50 DC @ 2 ml/l and (fipronil 40% + imidaclopride 40% WG) @ 5 g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l were found highly effective against aphid. The highest yield of 692 kg/ha was obtained from the treatment of (ST with fipronil 40% + imidaclopride 40% WG) @ 5g/kg + FS of afidopyropen @ 2 ml/l which was statistically at par with seed treatment of (chlothiodin 50 WDG) @ 7.5 g/kg + FS of afidopyropen 50 DC @ 2ml/l (680 kg/ha) and ST with (fipronil 40% + imidaclopride 40% WG) @ 5 g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l (672 kg/ha). The highest ICBR (1:8.68) was obtained from the treatment of (ST with fipronil 40% + imidaclopride 40% WG) @ 5g /kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l.

Keywords: sesame, aphid, sulfoxaflor, fipronil, afidopyropen, imidacloprid, efficacy**Introduction**

Sesame is the ancient oilseed crop of India, is grown from time immemorial. Its seeds contain 52-57 per cent oil and 25 per cent protein (Smith *et al.*, 2000). Its cultivation gained impetus because of high quality edible oil, rich source of carbohydrate, protein, calcium and phosphorus (Prasad *et al.*, 2002), So, known as queen of oil seeds. It is used in confectioneries, cookies, cake, margarine, bread making etc. Sesame is rich in natural antioxidants or lignin's, which are both oil and water soluble provide very long shelf life and

stable characteristics of sesame seed and oil (Ermiya *et al.*, 2009).

Sesame is attacked by different species of insect pests but sucking insects have great economic importance to sesame plants. Aphid, *Aphis gossypii* (Glover) is serious pest which suck the cell sap from leaves, flowers and capsules. Due to this downward curling of leaf margins, reddening of leaf margins, stunted growth of the plants, sickly appearance of the crop and subnormal growth of the leaf tissue occur (El-Gindy, 2002). The use of insecticides

has undoubtedly resulted in the maximum production of food grain for the world food supply, but the proliferation of insecticides and their unilateral utilization have posed many problems such as development of resistance in insect pests to insecticides, resurgence of insect pests, outbreak of secondary insect pests, insecticidal residues etc. Frequent use of single pesticide will not provide effective management of these pests. Therefore, in sesame crop, it is a prime need to find out such pesticides which was effectively control the various sucking pest attacking this crop. Presently, various new molecules with different mode of action are available, that necessitate evaluation against the aphid in summer sesame.

Materials and Methods

In order to study the efficacy of different molecules of insecticides against

aphid, the experiment was conducted in summer 2021 at the Instructional Farm, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh. Sesame variety G.Til-3 was sown at a spacing of 30 cm x 10 cm. All the recommended agronomical practices were followed. Seed treatment was given at the time of sowing, whereas foliar spray was given at the time of substandard population of aphid. The data on population of aphid was recorded on three leaves (top, middle and bottom canopy of the plants) per plant by randomly selecting five plants from each plot and tagged. The pre-treatment observation was recorded at one day before 1st spray and post treatment observations were recorded at 3, 7 and 10 days after each spray. Statistical analysis was carried out using ANOVA technique given by Panse and Sukhatme (1985).

Treatment details

No.	Treatment*	Dose
T ₁	ST with clothianidin 50% WDG	7.5 g/kg seed
T ₂	ST with fipronil 40% + imidacloprid 40% WG	5 g/kg seed
T ₃	T ₁ +FS of afidopyrofen 50 DC	7.5 g/kg seed+2 ml/l
T ₄	T ₁ +FS of flupyradifurone 200 SL	7.5 g/kg seed+1.5 ml/l
T ₅	T ₁ +FS of sulfoxaflor 24% SC	7.5 g/kg seed+1.5 ml/l
T ₆	T ₂ +FS of afidopyrofen 50 DC	5 g/kg seed+ 2 ml/l
T ₇	T ₂ +FS of flupyradifurone 200 SL	5 g/kg seed+1.5 ml/l
T ₈	T ₂ +FS of sulfoxaflor 24% SC	5 g/kg seed+1.5 ml/l
T ₉	Control	

*ST: Seed Treatment; FS: Foliar Spray; WDG/WG: Water Dispersible Grannules; DC: Dispersible Concentrate; SC: Suspension Concentrate; SL: Soluable Concentrate.

Results and discussion

Results showed that all the treatments having treated seeds were found significantly superior over the control in reducing the incidence of aphid. The result based on mean aphid population are presented in Table 1 indicate the pre foliar spray count of aphid showed that the aphid population in plots having treated seed with fipronil 40% + imidaclopride 40% WG @ 5g /kg varied from (1.58 to 1.68 aphid /3 leaves) and seed treated with clothianidin 50 WDG @ 7.5 g/kg varied from (1.84 to 1.91 aphid /3 leaves). However, significantly higher population of aphid (2.38 aphid /three leaves/plant) was recorded in control plot.

The data on mean number of aphid population after three days of application of insecticides presented in Table 1 indicate that all the treatments were found significantly superior over untreated plot. Seed treatment with fipronil 40% + imidaclopride 40% WG @ 5g /kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l and seed treatment with clothianidin 50 WDG @ 7.5g /kg + FS of sulfoxaflor 24% SC @ 1.5 ml /l were found most effective (0.38 /3 leaves), which was at par with seed treatment of fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l and seed treatment of clothianidin 50 WDG + FS of flupyradifurone 200 SL @ 1.5 ml/l which gave (0.52 aphid /3 leaves). Seed treatments with fipronil 40% + imidaclopride 40% WG @ 5g /kg + FS of afidopyropen 50 DC @ 2

ml/l (1.14/3 leaves) and ST with clothianidin 50 WDG @ 7.5g /kg + FS of afidopyropen 50 DC @ 2 ml /l (1.33/3 leaves) were found medium in their effectiveness.

All the treatments were found significantly superior over untreated plot after seven days of application of insecticides. Seed treatment with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of afidopyropen 50 DC @ 2 ml/l was found most effective which gave 0.26 aphid per three leaves which was at par with seed treatment of clothianidin 50 WDG @ 7.5 g/kg + FS of afidopyropen 50 DC @ 2 ml/l (0.31/3 leaves). While, treatments comprising of ST with fipronil 40% + imidaclopride 40% WG @ 5g /kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l (0.79/3 leaves), ST with clothianidin 50 WDG @ 7.5 g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l (0.96/3 leaves), ST with clothianidin 50 WDG @ 7.5 g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l (1.14/3 leaves) and ST with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l (1.16/3 leaves) were found next best in their effectiveness.

Seed treatment with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of afidopyropen 50 DC @ 2 ml/l was found most effective (0.99 per three leaves) and it was statistically at par with seed treatment of clothianidin 50 WDG @ 7.5 g/kg + FS of afidopyropen 50 DC @ 2 ml/l (1.06/3 leaves) after ten days of application of insecticides.

The seed treatment with clothianidin 50 WDG @ 7.5 g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l (1.27 /3 leaves), ST with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l (1.46/3 leaves), ST with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l and ST with clothianidin 50 WDG @ 5g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l (1.52 /3 leaves) and seed treatment with fipronil 40% + imidaclopride 40% WG @ 5 g/kg (1.66 /3 leaves) were found next effective in order of efficacy. More or less similar trend of aphid population recorded after second spray of insecticides.

Data presented in Table 3 indicate that a difference in grain yield was significant. The highest yield of 692 kg/ha was obtained from the treatment of ST with fipronil 40% + imidaclopride 40% WG @ 5g /kg + FS of afidopyropen 50 DC @ 2 ml/l which was found statistically at par with the seed treatment of clothianidin 50 WDG @ 7.5g/kg + FS of afidopyropen 50 DC @ 2 ml/l (680 kg/ha) and ST with fipronil 40 % + imidaclopride 40% WG @ 5g/kg + FS of sulfoxaflor 24% S.C @ 1.5 ml/l (672 kg/ha). The highest (1:8.66) Incremental Cost Benefit Ratio was obtained from the seed treatment of fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l it is followed by seed treatment of clothianidin 50 WDG @ 7.5 g/kg + FS of sulfoxaflor 24 % SC @ 1.5 ml /l

(1:8.33) and ST with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of flupyradifurone 200 SL @ 1.5 ml/l (1:7.44).

According to Ambarish *et al.* (2017), the lowest number of aphids (1.71) was recorded in the application of sulfoxaflor 30 % @ 108 g. *a.i* /ha. Prasad (2017) recorded that flupyradifurone 200 SL at lower dose of 150g *a.i*/ha was found superior in efficacy against cotton aphid. Garg *et al.* (2018) reported that flupyradifurone 200 SL @ 125, 150, 175 g *a.i*/ha was found effective for managing aphid population in okra. Singh *et al.* (2020) reported the lowest population of aphid 1.33/five leaves/plant after 10 days of spray in flupyradifurone 200 SL @ 2.5 ml/l in okra. Susheel kumar *et al.* (2020) reported that afidopyropen 50 DC @ 2 ml/l showed 82.91, 77.48, and 76.59% aphid reduction in the pest population. So, the results obtained from the present finding are closely fitted with the result reported by earlier worker.

Conclusion

Considering the efficacy, yield and economics of insecticides, seed treatment with fipronil 40% + imidaclopride 40% WG @ 5g/kg + FS of afidopyropen 50 DC @ 2 ml/l were found highly effective against aphid. The treatment comprising of ST with fipronil 40% + imidaclopride 40% WG @ 5 g/kg + FS of sulfoxaflor 24% SC @ 1.5 ml/l and ST with clothianidin 50 WDG @ 7.5 g/kg + FS of afidopyropen 50 DC @ 2ml/l were found moderately effective.

Table 1. Bio-efficacy of different insecticide against aphid after first spray

Sr. No.	Treatment	Dose (g/kg & ml/l)	Mean number of aphid /3 leaves			
			Before spray	3 DAS	7 DAS	10 DAS
T ₁	ST with clothianidin 50WDG	7.5g	1.36 (1.84)	1.31 (1.72)	1.36 (1.86)	1.38 (1.91)
T ₂	ST with Fipronil 40% + Imidaclopride 40% WG	5g	1.26 (1.58)	1.26 (1.59)	1.31 (1.72)	1.29 (1.66)
T ₃	T ₁ +FS of afidopyropen 50DC	7.5g + 2ml	1.38 (1.91)	1.15 (1.33)	0.56 (0.31)	1.03 (1.06)
T ₄	T ₁ +FS of flupyradifurone 200SL	7.5g +1.5ml	1.36 (1.85)	0.72 (0.52)	1.07 (1.14)	1.23 (1.52)
T ₅	T ₁ +FS of sulfoxaflor 24% SC	7.5g +1.5ml	1.36 (1.84)	0.62 (0.38)	0.93 (0.96)	1.13 (1.27)
T ₆	T ₂ +FS of afidopyropen50DC	5g + 2ml	1.30 (1.68)	1.07 (1.14)	0.51 (0.26)	1.00 (0.99)
T ₇	T ₂ +FS of flupyradifurone 200 SL	5g +1.5ml	1.26 (1.58)	0.72 (0.52)	1.06 (1.12)	1.23 (1.52)
T ₈	T ₂ +FS of sulfoxaflor 24% SC	5g +1.5ml	1.28 (1.65)	0.62 (0.38)	0.89 (0.79)	1.21 (1.46)
T ₉	Control		1.54 (2.38)	1.59 (2.53)	1.55 (2.40)	1.57 (2.45)
	S. Em.±	T	0.08	0.06	0.06	0.06
		P	-	-	-	-
		T×P	-	-	-	-
C. D. at 5 %	T	0.23	0.17	0.18	0.18	
	P	-	-	-	-	
	T×P	-	-	-	-	
C. V.%		10.21	9.57	9.92	8.62	

Figures within parentheses indicate retransform values, while outside are square root transformed value

Table 2. Bio-efficacy of different insecticide against aphid after second spray

Sr. No.	Treatment	Dose (g/kg & ml/l)	Mean number of aphid /3 leaves			
			Before spray	3 DAS	7 DAS	10 DAS
T ₁	ST with clothianidin 50WDG	7.5g	1.46 (2.12)	1.46 (2.12)	1.48 (2.19)	1.52 (2.32)
T ₂	ST with fipronil 40% + Imidaclopride 40% WG	5g	1.38 (1.91)	1.43 (2.05)	1.46 (2.12)	1.46 (2.12)
T ₃	T ₁ +FS of afidopyropen 50DC	7.5g + 2ml	1.43 (2.05)	1.07 (1.14)	0.62 (0.38)	1.00 (0.99)
T ₄	T ₁ +FS of flupyradifurone 200SL	7.5g +1.5ml	1.41 (1.99)	0.80 (0.65)	1.18 (1.39)	1.28 (1.65)
T ₅	T ₁ +FS of sulfoxaflor 24% SC	7.5g +1.5ml	1.38 (1.90)	0.76 (0.58)	1.09 (1.20)	1.26 (1.59)
T ₆	T ₂ +FS of afidopyropen50DC	5g + 2ml	1.34 (1.79)	1.15 (1.33)	0.51 (0.26)	0.84 (0.71)
T ₇	T ₂ +FS of flupyradifurone 200 SL	5g +1.5ml	1.36 (1.84)	0.68 (0.46)	1.13 (1.27)	1.26 (1.59)
T ₈	T ₂ +FS of sulfoxaflor 24% SC	5g +1.5ml	1.34 (1.79)	0.62 (0.38)	1.09 (1.20)	1.23 (1.51)
T ₉	Control		1.48 (2.19)	1.50 (2.25)	1.57 (2.46)	1.63 (2.65)
	S. Em.±	T	0.07	0.07	0.06	0.07
		P	-	-	-	-
		T×P	-	-	-	-
C. D. at 5 %	T	NS	0.20	0.17	0.22	
	P	-	-	-	-	
	T×P	-	-	-	-	
C. V.%		8.47	10.86	8.79	9.84	

Figures within parentheses indicate retransform values, while outside are square root transformed value

Table 3. Economics of different treatment applied for the control of aphid of summer sesame

Sr	Treatments	Total quantity for 2 sprays (g or ml/ha)	Price of Insecticide (Rs./lit. or kg)	Cost of Insecticide (Rs./ha.)	Total cost of Treatment (Rs./ha)	Yield/ha	Gross Realization (Rs./ha)	Net realization (Rs./ha)	ICBR
T ₁	ST with clothianidin 50WDG	30g	13000	390	890	399	45087	5424	1:6.09
T ₂	ST with fipronil 40% + Imidacloprid 40%WG	20g	15600	312	820	404	45652	5989	1:7.37
T ₃	T ₁ +FS of afidopyropen 50DC	30+1.600	3197	390+5115	6505	680	76840	37177	1:5.71
T ₄	T ₁ +FS of flupyradifurone 200SL	30+1.200	4080	390+4896	6286	652	73676	34013	1:5.41
T ₅	T ₁ +FS of sulfoxaflor 24% SC	30+1.200	2390	390+2868	4258	665	75145	35482	1:8.33
T ₆	T ₂ +FS of afidopyropen50DC	20+1.600	3197	312+5115	6427	692	78196	38533	1:6.00
T ₇	T ₂ +FS of flupyradifurone 200 SL	20+1.200	4080	312+4896	6208	658	74354	34691	1:5.59
T ₈	T ₂ +FS of sulfoxaflor 24% SC	20+1.200	2390	312+2868	4180	672	75936	36273	1:8.68
T ₉	Control	-	-	-	-	351	39663	-	-

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