



EFFICACY OF SOME INSECTICIDES AGAINST APHID, *APHIS CRACCIVORA* KOCH IN FENUGREEK

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ABSTRACT

A field experiment was carried out to test the efficacy of insecticides against aphid *Aphis craccivora* in fenugreek at the Research Farm, Agricultural Research Station, Mandor- Jodhpur during rabi, 2021-22. After two sprays, flonicamid 50 WG was found most effective while azadirachtin 10,000 ppm (4.73 aphids/ 5 cm central shoot) treated plots was found least effective. Maximum yield (1722 kg/ ha) was obtained from the plots treated with flonicamid 50 WG. The highest benefit-cost ratio was observed with thiamethoxam 25 WG (3.79:1) followed by flonicamid 50 WG (3.57:1). All the treatments showed no harmful effect on the natural enemies especially the coccinellids.

Key words: *Trigonella foenum-graecum*, *Aphis craccivora*, insecticides, flonicamid azadirachtin, efficacy, coccinellids, yield, comparative economics, benefit cost ratio

Fenugreek (*Trigonella foenum-graecum* L.) commonly known as methi, is infested by various insect pests viz., aphids, *Aphis craccivora* Koch and *Acyrtosiphon pisum* (Harris); whitefly *Bemisia tabaci* (Genn.); leaf hopper, *Empoasca kerri* (Pruthi); leaf miner *Liriomyza congesta* (Becker); thrips *Thrips tabaci* (Lindeman); leaf eating caterpillar *Spodoptera litura* F.; weevil, *Hypera postica* (Gyllenhal) and *Hypera branneipennis* (Boh.) (Kalra et al., 2002; Manjula et al., 2015). Evidently, sucking insect pests are most damaging as their heavy population developed during flowering and pod stages causing significant losses (Abro et al., 2016). Among them, *A. craccivora* is the major insect pest of fenugreek. It is a cosmopolitan, polyphagous species and causes not only losses in the grain yield but also deteriorate the quality of green leaves. A loss upto 62.3 to 68.8% was recorded due to aphid infestation in fenugreek (Sharma and Kalra, 2002). Aphids are fast growing species and the control over the infesting population of aphid is difficult. Novel insecticides play role in controlling target specific pest within short time span, simultaneously have less toxic effect on non-target pests. The use of various insecticides for management of aphid in other crops have been suggested by many workers. Scanty information is available for the management of aphid in fenugreek. Therefore, the present study to test the efficacy of insecticides against *A. craccivora* in fenugreek.

MATERIALS AND METHODS

The field experiment was conducted at the Research Farm, Agricultural Research Station, Mandor during

rabi, 2021-22. Variety RMt-305 was sown in the first fortnight of November with plot size measuring 3 x 4 m with row to row 30 cm distance. The experiment was laid out in randomized block design with ten treatments viz., acephate 75 SP @ 750 g/ ha, flupyradifuron 17.09 SL @ 1250 ml/ ha, thiamethoxam 25 WG @ 100 g/ ha, acetamiprid 20 SP @ 75 g/ ha, cyantraniliprole 10.26 OD @ 600 ml/ ha, dinotefuran 20 SG @ 150 g/ ha, buprofezin 25 SC @ 1000 ml/ ha, azadirachtin 10,000 ppm @ 500 ml/ha, flonicamid 50 WG @ 150 g/ ha and untreated control. Two sprays of the insecticides were applied at an interval of 15 days. The first spray was done on second fortnight of January when the aphid population was sufficiently buildup whereas the second spray was applied after 14 days of the first spray.

The observations on aphid incidence were recorded from 5 cm of central shoot from the five randomly selected plants at one day before and 1, 3, 7, 10 and 14 days after treatments (Kant et al., 2017). The population of natural enemies were also recorded after the first and second spray from all the plots at 1, 3, 7, 10 and 14 days of application. The data were subjected to square root transformation before ANOVA. The seed yield was recorded from each plot at harvesting and then computed to kg/ ha. The comparative economics were also worked out following standard procedure (Spackova and Straub, 2015).

RESULTS AND DISCUSSION

After two sprays incidence, the plots treated with

flonicamid 50 WG showed no aphid and it was found significantly superior Cyantraniliprole 10.26 OD was the next effective (0.67 aphids/5 cm central shoot Azadirachtin 10,000 ppm (4.73 aphids/ 5 cm central shoot) was found least effective (Table 1). Sarvaiya and Patel (2018) reported that of flonicamid 50 WG (0.015%) was effective. Similarly, Shewale and Borad (2020) reported that flonicamid 50 WG (0.015%) was the most effective against aphid *Hyadaphis coriandri* in fennel. There was no harmful effect of insecticides on the population of coccinellids as these showed non-significant differences (Table 2). Vaani et al. (2016) reported that insecticides viz., flonicamid 50 WG, thiamethoxam 25 WG, acephate 75 SP, acetamiprid 20 SP, buprofezin 50 SC and dinotefuran 20 SG were safe to coccinellids in safflower. Similarly, Italiya et al. (2018) reported that the insecticides viz., flonicamid 50 WG, thiamethoxam 25 WG and acephate 75 SP had no adverse effect on coccinellids in cumin. Flonicamid 50 WG proved safer to coccinellids in cotton (Hemlatha et al., 2019). Khunt et al. (2022) reported that afidopyropen 5 DC, cyantraniliprole 10.26 OD and flonicamid 50 WG insecticides were safer against coccinellids in fennel.

Maximum yield (1722 kg/ha) was obtained with flonicamid 50 WG followed by obtained cyantraniliprole 10.26 OD and thiamethoxam 25 SG with 1639 kg/ ha and 1611 kg/ ha, respectively (Table 1). Sarvaiya and Patel (2018) reported that the maximum fenugreek seed yield was obtained with flonicamid. Katesiya and Prajapati (2019) also found flonicamid giving highest seed yield (1012 kg/ ha) followed by thiamethoxam 25 in isabgol. Patel et al. (2021) reported highest coriander seed yield with tolfenpyrad 15 EC followed by flonicamid 50 WG Kanjiya (2017) reported maximum seed yield with flonicamid in fennel. The highest benefit-cost ratio (B:C ratio) was obtained with thiamethoxam 25 WG (3.79:1) followed by flonicamid 50 WG (3.57:1) and acephate 75 SP (3.54:1)(Table 1). Kumar et al., (2017) reported maximum incremental benefit cost ratio was with imidacloprid (0.005%) followed by thiamethoxam 25 WG in fenugreek. Kanjiya (2017) obtained maximum cost benefit with dimethoate 30 EC followed by flonicamid 50 WG and thiamethoxam 25 WG in fennel. Choudhary et al. (2017) found thiamethoxam 25 WG better in cowpea followed by imidacloprid 17.8 SL and dimethoate 30 EC.

ACKNOWLEDGEMENTS

The contribution of Dr Sunil Joshi, Principal Scientist, National Bureau of Agricultural Insect

Resources (NBAIR), Bengaluru is acknowledge for the identification of the aphid species. The authors thank the Zonal Director of Research, Agricultural Research Station, Mandor and Dean, College of Agriculture, Jodhpur for providing necessary facilities.

FINANCIAL SUPPORT

No funding.

AUTHOR CONTRIBUTION STATEMENT

Conceptualization of research, designing, analysis, interpretation of the data and preparation of the manuscript (SM and SP). Execution of the experiment and data collection (SM). Both the authors read and approved the final manuscript. All the data and material available with the author (SM).

CONFLICT OF INTEREST

The authors have declared no conflicts.

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Table 1. Efficacy and economics of insecticides against *A. craccivora* infesting fenugreek

Treatment	*Population of aphid per 5 cm central shoot														Seed yield (kg/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C
	First spray							Second spray										
	PTP	1	3	7	10	14	DAS	1	3	7	10	14	DAS	DAS				
Accephate 75 SP @750 g/ha	43.26 (6.56)	41.73 (6.44)	25.53 (5.04)	4.13 (2.02)	12.73 (3.55)	30.73 (5.53)	DAS	28.86 (5.36)	16.13 (4.00)	3.20 (1.92)	1.67 (1.47)	1.13 (1.27)	1583	94980	68180	3.54:1		
Flupyradifurone 17.09 SL @1250 ml/ ha	46.06 (6.77)	45.13 (6.70)	26.80 (5.16)	5.06 (2.23)	14.93 (3.84)	32.26 (5.67)	DAS	30.46 (5.50)	19.67 (4.41)	4.33 (2.18)	2.33 (1.68)	1.73 (1.49)	1472	88320	53070	2.50:1		
Thiamethoxam 25 WG @100 g/ ha	43.06 (6.55)	42.20 (6.48)	25.13 (5.00)	3.80 (1.93)	11.13 (3.31)	30.20 (5.47)	DAS	28.66 (5.34)	15.86 (3.97)	2.67 (1.76)	1.67 (1.47)	1.00 (1.22)	1611	96660	71160	3.79:1		
Acetamiprid 20 SP @75 g/ ha	45.60 (6.73)	44.13 (6.63)	26.93 (5.18)	5.60 (2.35)	16.00 (3.98)	33.93 (5.81)	DAS	32.20 (5.66)	19.80 (4.38)	4.67 (2.26)	2.40 (1.70)	2.00 (1.57)	1444	86640	61265	3.41:1		
Cyantraniliprole 10.26 OD @600 ml/ ha	44.33 (6.64)	43.20 (6.55)	24.46 (4.93)	3.13 (1.76)	10.80 (3.27)	29.13 (5.38)	DAS	28.06 (5.29)	13.00 (3.59)	2.33 (1.73)	1.33 (1.34)	0.67 (1.07)	1639	98340	62273	2.72:1		
Dinotefuran 20 SG @150 g/ ha	43.93 (6.62)	42.80 (6.52)	27.46 (5.23)	6.26 (2.49)	18.46 (4.27)	34.06 (5.82)	DAS	32.46 (5.69)	20.13 (4.48)	5.06 (2.35)	3.06 (1.86)	2.20 (1.64)	1417	85020	57395	3.07:1		
Buprofezin 25 SC @1000 ml/ ha	45.66 (6.74)	44.73 (6.66)	26.40 (5.12)	4.67 (2.14)	13.06 (3.59)	31.26 (5.58)	DAS	29.06 (5.38)	18.20 (4.22)	4.20 (2.16)	2.06 (1.58)	1.67 (1.46)	1500	90000	62810	3.31:1		
Azadirachtin 10,000 ppm @500 ml/ ha	43.73 (6.59)	42.67 (6.50)	36.46 (6.02)	30.20 (5.48)	36.73 (6.04)	43.53 (6.59)	DAS	40.86 (6.39)	32.86 (5.72)	10.33 (3.29)	6.86 (2.72)	4.73 (2.28)	1306	78360	50820	2.84:1		
Flonicamid 50 WG @150 g/ ha	45.00 (6.69)	42.67 (6.51)	17.46 (4.16)	0.60 (0.76)	6.33 (2.51)	21.06 (4.57)	DAS	19.33 (4.35)	7.93 (2.80)	0.00 (0.70)	0.00 (0.70)	0.00 (0.70)	1722	103320	74450	3.57:1		
Untreated control	43.00 (6.53)	44.80 (6.68)	49.53 (7.03)	51.00 (7.13)	53.26 (7.29)	55.00 (7.41)	DAS	56.26 (7.49)	56.66 (7.52)	30.67 (5.57)	15.26 (3.97)	7.86 (2.88)	1139	68340	44340	2.84:1		
SEm ±	0.30	0.30	0.24	0.16	0.23	0.25	DAS	0.23	0.23	0.13	0.09	0.07	91	-	-	-	-	
CD (p=0.05)	NS	NS	0.72	0.47	0.70	0.76	DAS	0.69	0.70	0.40	0.27	0.20	270	-	-	-	-	

Figures in parentheses are square root transformed values; PTP – Pretreatment population; *Mean of 15 plants; Cost of acephate –Rs. 120/ 100 g; Cost of dinotefuran –Rs. 875/ 100 g; Cost of buprofezin –Rs. 1095/ 1000 ml; Cost of azadirachtin –Rs. 635/ 250 ml; Cost of fonicamid –Rs. 1935/ 150 g; Cost of flupyradifurone – Rs. 410/ 100; Cost of thiamethoxam –Rs. 250/ 100 g; Cost of acetamidrid –Rs. 125/50 g; Cost of cyantraniliprole –Rs. 830/ 90 ml; Price of fenugreek – Rs. 60/ kg; Labour charges @ Rs. 250/ labour/ day (2 labour/ spray/ ha); Cost of cultivation – Rs. 24,000/ ha

Table 2. Effect of insecticides on natural enemies (coccinellids) in fenugreek

Treatment	PTP	*Population/ plant													
		First spray							Second spray						
		1	3	7	10	14	1	3	7	10	14	1	3	7	10
		DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS
Acephate 75 SP	0.46 (0.67)	1.00 (0.99)	1.40 (1.17)	2.60 (1.60)	3.40 (1.84)	3.46 (1.85)	3.73 (1.92)	4.13 (2.02)	5.20 (2.27)	4.00 (2.00)	2.33 (1.51)				
@750 g/ ha															
Flupyradifurone 17.09 SL	0.67 (0.81)	0.93 (0.96)	1.80 (1.31)	2.53 (1.58)	2.86 (1.69)	3.80 (1.94)	3.67 (1.90)	4.53 (2.12)	4.93 (2.21)	3.33 (1.82)	2.86 (1.68)				
@1250 ml/ ha															
Thiamethoxam 25 WG	0.60 (0.76)	0.93 (0.96)	1.26 (1.12)	2.40 (1.54)	3.33 (1.82)	3.60 (1.89)	3.80 (1.94)	4.67 (2.15)	5.46 (2.33)	3.86 (1.96)	2.53 (1.57)				
@100 g/ ha															
Acetamiprid 20 SP	0.53 (0.72)	1.00 (0.99)	1.53 (1.23)	2.80 (1.66)	3.00 (1.72)	3.67 (1.91)	4.00 (1.99)	4.93 (2.21)	5.06 (2.24)	3.46 (1.86)	2.60 (1.61)				
@75 g/ ha															
Cytraniliprole 10.26 OD	0.73 (0.85)	1.00 (0.99)	1.33 (1.15)	2.53 (1.58)	3.06 (1.75)	3.53 (1.87)	3.73 (1.93)	4.06 (2.00)	5.13 (2.26)	3.93 (1.98)	2.60 (1.61)				
@600 ml/ ha															
Dinotefuran 20 SG	0.73 (0.85)	1.06 (1.03)	1.46 (1.21)	2.86 (1.68)	3.26 (1.80)	3.86 (1.95)	3.93 (1.97)	4.60 (2.13)	5.46 (2.32)	3.53 (1.87)	2.73 (1.65)				
@150 g/ ha															
Buprofezin 25 SC	0.60 (0.77)	1.06 (1.02)	1.33 (1.15)	2.73 (1.63)	3.26 (1.80)	3.73 (1.92)	3.86 (1.95)	4.33 (2.07)	5.33 (2.30)	3.26 (1.80)	2.60 (1.61)				
@1000 ml/ ha															
Azadirachtin 10,000 ppm	0.80 (0.87)	1.13 (1.05)	1.33 (1.15)	2.53 (1.58)	3.33 (1.82)	3.73 (1.92)	3.93 (1.97)	4.40 (2.09)	5.40 (2.32)	3.13 (1.76)	2.80 (1.67)				
@500 ml/ ha															
Flonicamid 50 WG	0.67 (0.81)	0.86 (0.92)	1.26 (1.12)	2.73 (1.65)	2.93 (1.66)	3.46 (1.85)	3.53 (1.87)	4.26 (2.05)	5.06 (2.24)	3.73 (1.93)	2.86 (1.68)				
@150 g/ ha															
Untreated control	0.93 (0.95)	1.06 (1.03)	1.20 (1.09)	2.46 (1.56)	3.13 (1.76)	3.60 (1.89)	3.80 (1.94)	4.80 (2.18)	5.3 (2.30)	3.73 (1.93)	2.60 (1.61)				
SEm ±	0.06	0.06	0.07	0.08	0.10	0.10	0.10	0.11	0.10	0.08	0.10				
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS				

Figures in parentheses square root transformed values; NS = Non significant; PTP = Pretreatment population; *Mean of 15 plants

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(Manuscript Received: April, 2023; Revised: April, 2023;

Accepted: April, 2023; Online Published: April, 2023)

Online First in www.entosocindia.org and indianentomology.org Ref. No. e23016