



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
www.agronomyjournals.com
2024; 7(8): 744-748
Received: 08-06-2024
Accepted: 13-07-2024

Payal Kumari
Department of Zoology, Purnea
University, Purnia, Bihar, India

Rima Kumari
Division of Plant Biotechnology,
CABT, BAU, Sabour, Bihar, India

Md. Rauf Anwer
Department of Zoology, Purnea
University, Purnia, Bihar, India

Pankaj Kumar
Department of Molecular Biology
& Genetic Engineering, Bihar
Agricultural University, Sabour,
Bihar, India

Corresponding Author:
Payal Kumari
Department of Zoology, Purnea
University, Purnia, Bihar, India

Assessment of the efficiency of selected synthetic insecticides and one botanical product against whitefly in okra

Payal Kumari, Rima Kumari, Md. Rauf Anwer and Pankaj Kumar

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i8j.1365>

Abstract

It reveals that in 2020, the highest mean reduction in the population of *Bemisia tabaci* was recorded in treatment T₅, comprises a spray of Imidacloprid 17.80 SL which caused the mean reduction of 76.98, 69.34, 43.18 percent after 3, 7 and 14 days of spray, respectively with overall mean percent reduction of 63.17 percent in whitefly population. The second most effective treatment after Imidacloprid 17.80 SL was Acetamiprid 20SP (T₂). Treatment application of Acetamiprid 20SP causes a mean percent reduction of 64.82, 60.02 and 42.11 percent in the whitefly population, respectively. Following the Acetamiprid 20SP next, the best treatment was Thiomethoxam 25WG (T₇). Treatment application of Thiomethoxam 25WG causes a mean percent reduction of 66.21, 57.69 and 36.79 percent after 3, 7 and 14 days of spray, respectively in the whitefly population. Treatment application of Acephate 95 SG causes a mean percent reduction of 58.20, 49.14 and 34.46 percent in whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of Indoxacarb 14.5SC (T₆) causes a mean percent reduction of 54.84, 51.04 and 28.85 percent in whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of Oxydemeton-methyl 25 EC (T₈) causes a mean percent reduction of 53.95, 48.36 and 23.81 percent after 3, 7 and 14 days of spray, respectively. Whereas, the treatment application of *Azadirachta indica* 1% EC (T₁) and Bifenthrin 10 EC (T₄) were at par to each other in their efficacy against the whitefly population and causes a mean percent reduction of 45.36, 49.31 and 14.33 and 45.45, 39.72 and 22.17 percent in whitefly population.

Keywords: Whitefly, synthetic insecticides, okra

Introduction

Okra (*Abelmoschus esculentus* L. Moench) belong to the family Malvaceae and also known as lady's finger, or bhindi. It is originated in Ethiopia and an important warm season vegetable crop grown extensively in tropical and subtropical regions of the world. It is a short duration vegetable crop propagated by seeds. Tender and immature seeded green fruit is used to prepare different product like curries, soups, or in canned, dehydrated, or frozen forms for off-season consumption (Neeraja *et al.*, 2004) [5]. Okra is more remunerative than the leafy vegetables. The roots and stems are useful for clearing cane juice from which gur or jaggery is prepared (Chauhan, 1972) [6]. Its ripe seeds are roasted, ground and used as a substitute for coffee in Turkey. Fruits have high nutritional value, containing proteins, calcium, phosphorus, iron, carotene, and vitamins A, B, and C (Singh *et al.*, 2001) [7], which are very useful against genito-urinary disorders, spermatorrhoea, and chronic dysentery. In India, the total production of vegetables is 199.88 MT with cultivated area of 11.06 M ha, from which cultivation of okra on area 0.52 million hectares and production of 6.43 million Metric tonnes produced per year. In Bihar, an area of 59.20 thousand hectares and production of 794.10 thousand metric tonnes was under okra cultivation. *Bemisia tabaci* is a polyphagous insect which can cause damage to various crop viz. cotton, brinjal, lady's finger, some other vegetables, and ornamental plants. Whiteflies cause damage to plants in two ways firstly by sucking the sap and transmitting viral disease and secondly by excreting honey dew on which black sooty mould grows. Whiteflies have become one of the most serious crop protection problems (Gangwar and Gangwar, 2018) [8].

In the present scenario, schedule-based application of various insecticides are recommended for the management of different insect pests. In view of the damage caused by the whitefly the experiment on the Assessment of the efficiency of selected synthetic insecticides and one botanical product against whitefly was carried out.

Materials and Methods

Seed rate and method of sowing

The seeds were sown at the recommended seed rate of 10 kg per ha in all experimental plots. Before sowing, seeds were treated with captain at the rate of 2.0 g per kg seeds. The seeds were sown by dibbling method keeping row to row and plant to plant distance of 60 and 30 cm, respectively.

Irrigation schedule and cultural practises

In the *Kharif* season, crops need irrigation during long spells of drought for quick plant growth and fruit formation. The okra crop was irrigated at 10 day intervals. Thinning and gap filling were done during early stage of plant growth and plant-to-plant distance of 30 cm maintained. The other recommended agronomic practises (weeding, hoeing, etc.) were followed as and when needed.

Treatments/Insecticides

All the insecticides were made available through the department of Entomology, Purnea University, Purnea. The details of these insecticides are given in Table 1.

Table 1: Treatment details of insecticides

S. No.	Treatments	Formulation	Dose/ha or Concentration
1.	<i>Azadirachta indica</i>	1% EC	69.20%
2.	Acetamiprid 0.005%	20SP	0.5 g/l
3.	Imidacloprid 0.01%	17.80 SL	0.5 ml/l
4.	Thiomethoxam 0.005%	25WG	0.3 g/l
5.	Indoxacarb	14.5SC	1.11 ml/l
6.	Bifenthrin	10 EC	1.6 ml/l
7.	Oxydemeton-methyl	25 EC	0.03%
8.	Acephate 25 SG	95 SG	0.3 g/l
9.	Untreated control	-	

Insecticide application

Application of insecticides were manually operated by knap sack sprayer. Each pesticide formulation's dosage was calculated, then mixed with the necessary amount of water. All plants were covered with care and spraying vigorously while avoiding drift to surrounding area of plots. The spraying were carried out in the morning and care was taken to rinse the pump although changing from one insecticide to another. Total two spray were taken at 20 days of interval. The first spray was taken after 20 days of sowing and 2nd spray after 20 days of first spray.

Observations recorded for the insecticide treatments

Total five plants were randomly selected from the middle of each plot. The observations were taken from three separate leaves (top, middle, and bottom) of each selected plant. The white fly nymphs and adults were counted during 6 to 8 am in the morning when adults are least active. The pest population were counted a day before spray and nymphs and adults of whiteflies were counted at third, seventh, and fourteenth days after spray.

Statistical analysis

The data on percent mortality of nymphs and adults of whiteflies as well as mean data on percentage incidence of YVMV after

first and second spray were transformed to or arc sin angles and then subjected to standard statistical method of analysis. The standard error (S.E.) and critical difference (CD) at 5% level of probability were calculated, in order to know the efficacy of each insecticide in controlling whiteflies. On the basis of yield data the cost benefit ratio of each treatment was calculated.

Results

Bio-efficacy of 1st spray during year, 2020

The data presented in Table 2 reveals that the highest mean reduction in the population of *Bemisia tabaci* was recorded in treatment T₅, comprises a spray of Imidacloprid 17.80 SL which caused the mean reduction of 76.98, 69.34, 43.18 percent after 3, 7 and 14 days of spray, respectively with overall mean percent reduction of 63.17 percent in whitefly population. The second most effective treatment after Imidacloprid 17.80 SL was Acetamiprid 20SP (T₂). Treatment application of Acetamiprid 20SP causes a mean percent reduction of 64.82, 60.02 and 42.11 percent in the whitefly population, respectively. Following the Acetamiprid 20SP next, the best treatment was Thiomethoxam 25WG (T₇). Treatment application of Thiomethoxam 25WG causes a mean percent reduction of 66.21, 57.69 and 36.79 percent after 3, 7 and 14 days of spray, respectively in the whitefly population. Treatment application of Acephate 95 SG causes a mean percent reduction of 58.20, 49.14 and 34.46 percent in whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of Indoxacarb 14.5SC (T₆) causes a mean percent reduction of 54.84, 51.04 and 28.85 percent in whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of Oxydemeton-methyl 25 EC (T₈) causes a mean percent reduction of 53.95, 48.36 and 23.81 percent after 3, 7 and 14 days of spray, respectively. Whereas, the treatment application of *Azadirachta indica* 1% EC (T₁) and Bifenthrin 10 EC (T₄) were at par to each other in there efficacy against the whitefly population and causes a mean percent reduction of 45.36, 49.31 and 14.33 and 45.45, 39.72 and 22.17 percent in whitefly population.

Bio-efficacy of 2nd spray during year, 2020

The data presented in Table 3 reveals that the highest mean reduction in the population of *Bemisia tabaci* was recorded in treatment T₇, comprises a spray of Thiomethoxam 25WG which caused the mean reduction of 67.03, 63.77 and 59.94 percent after 3,7 and 14 days of spray, respectively with overall mean percent reduction of 63.58 percent in whitefly population. The second most effective treatment after Thiomethoxam 25WG was Imidacloprid 17.80 SL (T₅). Treatment application of Imidacloprid 17.80 SL causes a mean percent reduction of 16.41, 72.35 and 62.65 percent in the whitefly population, respectively which was at par with the treatment application of Acetamiprid 20SP (T₂) which causes a mean percent reduction of 57.94, 51.68 and 41.39 percent in whitefly population, respectively. Following the Acetamiprid 20SP next, the best treatment was Acephate 95 SG (T₃) which causes a mean percent reduction of 47.7, 43.15 and 49.84 percent after 3, 7 and 14 days of spray, respectively. The mean percent reduction in whitefly population by the treatment application of Oxydemeton-methyl 25 EC (T₈) was at par to treatment application of Indoxacarb 14.5SC, causes a mean percent reduction of 46.61, 40.85 and 40.74 and 42.70, 41.8 and 40.66 percent, respectively after 3, 7 and 14 days of spray, respectively. Treatment application of Thiomethoxam 25WG (T₇) causes a mean percent reduction of 66.21, 57.69 and 36.79 percent after 3, 7 and 14 days of spray, respectively in the in

whitefly population. The least effective treatment was Bifenthrin 10 EC (T₄) which causes a mean percent reduction of 34.93, 27.60 and 27.12 percent in the whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of

Azadirachta indica 1% EC (T₁) was at par with the Bifenthrin 10 EC. Application of *Azadirachta indica* 1% EC resulted in 28.57, 36.23 and 27.64 percent in the whitefly population after 3, 7 and 14 days of spray, respectively.

Table 2: Efficacy test of different insecticides against white fly of Okra crop in 2020 (1st Spray)

S. No.	Treatments	Dose (g or ml/L.)	1 DBS	Mean no. of whitefly/ three leaves per plant (1st spray)			Reduction percent			Mean reduction percent
				3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS	
T ₁	<i>Azadirachta indica</i> 1% EC	3 ml	8.50 (3.00)	5.53 (2.34)	5.87 (2.51)	8.85 (3.05)	45.36	49.31	14.33	36.33
T ₂	Acetamiprid 20SP	0.5 g/l	9.00 (3.08)	3.56 (1.87)	4.63 (2.26)	5.98 (2.53)	64.82	60.02	42.11	55.65
T ₃	Acephate 95 SG	0.3 g/l	8.33 (2.97)	4.23 (2.06)	5.89 (2.52)	6.77 (2.69)	58.20	49.14	34.46	47.27
T ₄	Bifenthrin 10 EC	1.6 ml/l	8.66 (3.03)	5.52 (2.35)	6.98 (2.73)	8.04 (2.92)	45.45	39.72	22.17	35.78
T ₅	Imidacloprid 17.80 SL	0.5 ml/l	9.12 (3.10)	2.33 (1.53)	3.55 (2.01)	5.87 (2.51)	76.98	69.34	43.18	63.17
T ₆	Indoxacarb 14.5SC	1.11 ml/l	10.00 (3.24)	4.57 (2.13)	5.67 (2.48)	7.35 (2.66)	54.84	51.04	28.85	44.91
T ₇	Thiomethoxam 25WG	0.3 g/l	9.56 (3.17)	3.42 (1.83)	4.9 (2.32)	6.53 (2.64)	66.21	57.69	36.79	53.56
T ₈	Oxydemeton-methyl 25 EC	1.5	8.69 (3.03)	4.66 (2.15)	5.98 (2.54)	7.87 (2.89)	53.95	48.36	23.81	42.04
T ₉	Untreated control		9.50 (3.16)	10.12 (3.18)	11.58 (3.47)	10.33 (3.29)				
	SEm±		0.058	0.14	0.13	0.15				
	CD at 5%		NS	0.41	0.40	0.45				
	CV (P= 0.05)		3.24	10.88	8.94	9.23				

Table 3: Efficacy test of different insecticides against white fly of Okra crop in 2020 (1st Spray)

S. No.	Treatments	Dose (g or ml/L.)	1 DBS	Mean no. of whitefly/ three leaves per plant (1st spray)			Reduction percent			Mean reduction percent
				3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS	
T ₁	<i>Azadirachta indica</i> 1% EC	3 ml	8.50 (3.00)	5.53 (2.34)	5.87 (2.51)	8.85 (3.05)	45.36	49.31	14.33	36.33
T ₂	Acetamiprid 20SP	0.5 g/l	9.00 (3.08)	3.56 (1.87)	4.63 (2.26)	5.98 (2.53)	64.82	60.02	42.11	55.65
T ₃	Acephate 95 SG	0.3 g/l	8.33 (2.97)	4.23 (2.06)	5.89 (2.52)	6.77 (2.69)	58.20	49.14	34.46	47.27
T ₄	Bifenthrin 10 EC	1.6 ml/l	8.66 (3.03)	5.52 (2.35)	6.98 (2.73)	8.04 (2.92)	45.45	39.72	22.17	35.78
T ₅	Imidacloprid 17.80 SL	0.5 ml/l	9.12 (3.10)	2.33 (1.53)	3.55 (2.01)	5.87 (2.51)	76.98	69.34	43.18	63.17
T ₆	Indoxacarb 14.5SC	1.11 ml/l	10.00 (3.24)	4.57 (2.13)	5.67 (2.48)	7.35 (2.66)	54.84	51.04	28.85	44.91
T ₇	Thiomethoxam 25WG	0.3 g/l	9.56 (3.17)	3.42 (1.83)	4.9 (2.32)	6.53 (2.64)	66.21	57.69	36.79	53.56
T ₈	Oxydemeton-methyl 25 EC	1.5	8.69 (3.03)	4.66 (2.15)	5.98 (2.54)	7.87 (2.89)	53.95	48.36	23.81	42.04
T ₉	Untreated control		9.50 (3.16)	10.12 (3.18)	11.58 (3.47)	10.33 (3.29)				
	SEm±		0.058	0.14	0.13	0.15				
	CD at 5%		NS	0.41	0.40	0.45				
	CV (P= 0.05)		3.24	10.88	8.94	9.23				

Table 4: Efficacy test of different insecticides against white fly of Okra crop in 2020 (2nd Spray)

S. No.	Treatments	Dose (g or ml/L.)	Mean no. of whitefly/ three leaves per plant (2 nd spray no.)				Reduction percent			Mean reduction percent
			1 DBS	3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS	
T ₁	<i>Azadirachta indica</i> 1% EC	3 ml	7.33 (3.03)	5.95 (2.53)	6.45 (2.62)	8.83 (3.05)	28.57	36.23	27.64	30.81
T ₂	Acetamiprid 20SP	0.5 g/l	8.54 (2.96)	3.50 (1.98)	4.89 (2.32)	7.15 (2.76)	57.94	51.68	41.39	50.34
T ₃	Acephate 95 SG	0.3 g/l	8.1 (2.93)	4.35 (2.19)	5.75 (2.50)	6.12 (2.56)	47.78	43.15	49.84	46.92
T ₄	Bifenthrin 10 EC	1.6 ml/l	7.2 (2.94)	5.42 (2.43)	7.33 (2.79)	8.90 (3.06)	34.93	27.60	27.12	29.88
T ₅	Imidacloprid 17.80 SL	0.5 ml/l	6.98 (3.05)	2.30 (1.67)	3.78 (2.06)	4.89 (2.32)	16.41	72.35	62.65	50.47
T ₆	Indoxacarb 14.5SC	1.11 ml/l	7.21 (2.89)	4.77 (2.29)	5.89 (2.52)	7.24 (2.78)	42.70	41.80	40.66	41.72
T ₇	Thiomethoxam 25WG	0.3 g/l	7.56 (2.98)	2.75 (1.80)	3.67 (2.03)	4.89 (2.31)	67.03	63.77	59.94	63.58
T ₈	Oxydemeton-methyl 25 EC	1.5	8.12 (3.04)	4.45 (2.22)	5.99 (2.54)	7.23 (2.78)	46.61	40.85	40.74	42.73
T ₉	Untreated control	-	8.35 (3.03)	8.33 (2.97)	10.12 (3.26)	12.21 (3.56)				
	SEm±		0.07	0.11	0.12	0.13				
	CD at 5%		NS	0.32	0.36	0.40				
	CV (P= 0.05)		4.12	8.22	8.29	8.18				

Discussion

Result on the bioefficacy of various synthetic insecticides and one botanical products obtained on the the reduction in whitefly population and mean percent reduction was discussed here. It reveals that in 2020, the highest mean reduction in the population of *Bemisia tabaci* was recorded in treatment T₅, comprises a spray of Imidacloprid 17.80 SL which caused the mean reduction of 76.98, 69.34, 43.18 percent after 3, 7 and 14 days of spray, respectively with overall mean percent reduction of 63.17 percent in whitefly population, Jakhar *et al.* (2016) ^[11]. The second most effective treatment after Imidacloprid 17.80 SL was Acetamiprid 20SP (T₂) Ahmed O. *et al.* (2010) ^[12]. Treatment application of Acetamiprid 20SP causes a mean percent reduction of 64.82, 60.02 and 42.11 percent in the whitefly population, respectively. Following the Acetamiprid 20SP next, the best treatment was Thiomethoxam 25WG (T₇) Oladimeji *et al.* (2010) ^[1]. Treatment application of Thiomethoxam 25WG causes a mean percent reduction of 66.21, 57.69 and 36.79 percent after 3, 7 and 14 days of spray, respectively in the in whitefly population, Ghosh, *et al.* (2013) ^[9]. Treatment application of Acephate 95 SG causes a mean percent reduction of 58.20, 49.14 and 34.46 percent in whitefly population after 3, 7 and 14 days of spray, respectively, Gupta *et al.* (2018) ^[10]. Treatment application of Indoxacarb 14.5SC (T₆) causes a mean percent reduction of 54.84, 51.04 and 28.85 percent in whitefly population after 3, 7 and 14 days of spray, respectively. Treatment application of Oxydemeton-methyl 25 EC (T₈) causes a mean percent reduction of 53.95, 48.36 and 23.81 percent after 3, 7 and 14 days of spray, respectively Singh *et al.* (2008) ^[3]. Whereas, the treatment application of *Azadirachta indica* 1% EC (T₁) and Bifenthrin 10 EC (T₄) were at par to each other in there efficacy against the whitefly population and causes a mean percent reduction of 45.36, 49.31 and 14.33 and 45.45, 39.72 and 22.17 percent in whitefly population Reddy *et al.* (2018) ^[4].

Conclusion

The study conducted in 2020 on the bio-efficacy of various

insecticides against *Bemisia tabaci* revealed that Imidacloprid 17.80 SL (T₅) was the most effective treatment, achieving the highest mean reduction in whitefly population across all observation periods (3, 7, and 14 days post-spray) with an overall mean reduction of 63.17%. Acetamiprid 20SP (T₂) and Thiomethoxam 25WG (T₇) were the second and third most effective treatments, respectively. Other treatments like Acephate 95 SG, Indoxacarb 14.5SC, and Oxydemeton-methyl 25 EC also demonstrated significant efficacy but were less effective compared to Imidacloprid 17.80 SL. The botanical product *Azadirachta indica* 1% EC and Bifenthrin 10 EC showed moderate efficacy, indicating their potential for integrated pest management strategies.

Reference

1. Oladimeji AO, Musa A. Comparative studies on the efficacy of neem, basil leaf extracts and synthetic insecticide, lambda-cyhalothrin, against *Podagrica* spp. on okra. African Journal of Microbiology Research. 2010;4(1):033-037.
2. Ahmed O, Kannike MA. Comparative studies on the efficacy of neem, basil leaf extract and synthetic insecticide, lambda-cyhalothrin, against *Podagrica* spp. on okra. African Journal of Microbiology Research. 2010;4(1):033-037.
3. Singh HKA, Yadav RN, Yadav KG, Adbhut Y, Yadav JL, Khilari K. Efficacy and economic of bio-pesticides for management of fruit borers in okra. Annals of Plant Protection Sciences. 2008;17(2).
4. Reddy BK, Paul A, Anitha N, George T, Amritha VS. Efficacy of insecticide mixtures against sucking pests of cowpea. Journal of Entomology and Zoology Studies. 2018;6(5):2246-2250.
5. Neeraja G, Vijaya M, Chiranjeevi CH, Gautham B. Screening of okra hybrids against pest and diseases. Indian Journal of Plant Protection. 2004;32(1):129-131.
6. Chauhan DVS. Vegetable production in India. Ram Prasad and Sons; c1972.

7. Singh G, Kawatra A, Sehgal S. Nutritional composition of selected green leafy vegetables, herbs and carrots. *Plant Foods for Human Nutrition*. 2001;56:359-364.
8. Gangwar RK, Gangwar C. Lifecycle, distribution, nature of damage and economic importance of whitefly, *Bemisia tabaci* (Gennadius). *Acta Scientific Agriculture*. 2018;2(4):36-39.
9. Ghosh SK, Mandal T, Chakraborty K. Efficacy of chemical insecticides and neem oil against white fly (*Bemisia tabaci* Genn.) infesting lady finger (*Abelmoschus esculentus* L.). *International Journal of Bio-resource and Stress Management*. 2013;4(2s):348-351.
10. Gupta SK, Thind TS. Disease problems in vegetable production. Scientific Publishers; c2018.
11. Jakhar BL, Kumar S, Ravindrababu Y. Efficacy of different newer insecticides against legume pod borer, *Maruca vitrata* (Geyer) on pigeonpea. *Research on Crops*. 2016;17(1):134-136.