Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(6): 1985-1988

Received: 02-09-2020
Accepted: 13-10-2020

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Population dynamics and field efficacy of certain insecticides against Whitefly, *Bemisia tabaci* (Gennadius) on Okra

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Abstract
The present investigation was conducted to study "Population dynamics and field efficacy of certain insecticides against Whitefly (*Bemisia tabaci*) (Gen) on Okra" during *kharif* 2019 at Central Research Field, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh (India). The occurence of Whitefly (*Bemisia tabaci*), commenced from 35th standard week (August fourth week) with an average population of 1.65 (Whiteflies /3 leaves) and then the population increased and gradually reached to its peak level by 42nd standard week (October second week) with an average population of 12.65 (Whiteflies /3 leaves) respectively where after a decline in population was observed as temperature decreased. On the basis of mean percent reduction over control in whitefly population, the treatment of imidacloprid 17.8 SL (81.52%) was found most effective, followed by Fipronil 5% SC (78.50%), Dimethoate 30 EC (74.63%), Malathion 50 EC (72.10%), Azadirachtin 1% EC (69.20%), Buprofezin 25 SC (66.18%), and Spinosad 45 SC (61.83%) was found to be least effective among all insecticides.

Keywords: Whitefly, *bemisia tabaci*, population, efficacy, insecticides, imidacloprid, Okra

1. Introduction
Vegetables are the affluent and cheaper source of minerals and vitamins. Among the divergent group of the vegetables, okra *Abelmoschus esculentus* L. (Moench) one of the commonly grown vegetable crop and popularly known as Hindi in India. It belongs to family malvaceae and is a short duration crop. Okra is one of the major cash crops in the country providing a good source of income and livelihood to the farmers. It accounts for about 60% of the total fresh vegetables export Pierce (1987) [12]. Okra serves as the house of pest and diseases. Insect pest's infestation is the prime and the most limiting factor in the successful cultivation of okra Tripathi *et al*., (2011) [16]. The crop is attacked by several insect-pests like *Earias vittella* Fabricus, *Helicoverpa armigera* Hubner, *Bemisia tabaci* Gennadius, *Amrasca bigutulla bigutulla* Ishida, *Aphis gossypii* Glover, *Sylepta derogata*, *Mylabris pustulatus*, *Oxycarenus hyalinipennis* and *Tetranychus urticae* etc. Sucking pests lead to maximum yield loss in okra. The recorded yield loss by whitefly is 94.0 percent and 54.04 percent by aphids Meenambigai *et al*., (2017) [8]. Many of the pests occurring on cotton are found to ravage okra crop. As high as 72 species of insects have been recorded on okra Srinivasa and Rajendran (2003) [15]. The adults suck the sap of the leaves and transmit the yellow vein mosaic virus disease of okra. Acharya *et al*. (2002) [1] studied the efficacy of the insecticides imidacloprid and dimethoate and reported they were safer to use in the presence of coccinellid predators. The objective of this study was to determine the efficacy of certain insecticides against white fly.

2. Materials and Methods
The experiment was conducted during the *kharif* season 2019 at Central Research Field, SHUATS, Prayagraj. The okra seeds of variety arka anamika were sown by dibbling method with spacing of 45 cm×30 cm by placing 2-3 seeds per hill. Gap filling and thinning was done to maintaining the optimum plant density and prevents competition among the plants. The experiment was laid out in randomized block design with eight treatments and three replications. The observations of population dynamics of whitefly were made at weekly interval starting from the appearance of the pest. The observation of the pest was recorded from three leaves each from top, middle and lower five randomly selected plants from every plot. The data was statistically analysed by correlation analysis between weather parameters and whitefly. The insecticide treatments include Imidacloprid 17.8 SL@ 0.3ml/lt, Buprofezin

25 SC@ 0.6 ml/lt, Dimethoate 30 EC@ 1.5 ml/lt, Malathion 50 EC@ 2 ml/lt, Azadirachtin 1% EC@ 2 ml/lt, Fipronil 5% SC@ 2 ml/lt, Spinosad 45 SC@ 1 ml/lt along with untreated control. The spraying was done after the population reaching its ETL. The incidence of whitefly was recorded from the five randomly selected and tagged plants from each plot. The number of whitefly per leaf were calculated based on the number of whitefly on three leaves, each taken from top, middle and bottom of each plant. The observations are made a day before followed by 3rd, 7th, 14th days after spraying. Observations were recorded without disturbing the plants to minimise the observational errors. Population of whitefly was recorded from each net plot and the population was worked out per 3 leaves. The percent reduction over untreated control was worked out using modified Abbot's formula given by Fleming and Ratnakaran [4]

$$P = \frac{100 \text{ X } 1 - (T_a \text{ X } C_b)}{(T_b \text{ X } C_a)}$$

Where,
P = Percentage population reduction over control;
Ta = Population in treatment after spray
Ca = Population in control after spray;
Tb = Population in treatment before spray
Cb = Population in control before spray

3. Results and Discussion

Studies on the incidence of Whitefly *Bemisia tabaci* population with weather parameters are given table 1 and fig 1. The Whitefly incidence on okra during *kharif* season 2019 was commenced from 35th standard week (August fourth week) with an average population of 1.65 (Whiteflies /3 leaves) and then the population increased and gradually reached to its peak level by 42nd standard week (October second week) with an average population of 12.65 (Whiteflies /3 leaves) respectively. There after declined trend was observed in Whitefly population. Similar, observations are reported by Singh and Thakur (2018) [14]. Similarly Mohapatra (2008) [10], reported that whiteflies infested the crop from 34th std. week to 49th std. week and peak population of was attained during 44th std. week. Ghosh (2014) [5] reported that pest population increased and reached highest population on the 42nd - 43rd SMW (mid of October) in the post *kharif* crop. Anurag and Chandrakar (2018) [2] reported that major activity period of *Bemisia tabaci* was appeared second week of August to last week of October 2016 with one distinct peak 38th SMW (4.89 whitefly/ per plant).

Table 1: Population dynamics of whitefly [*Bemesia tabaci* (Gen)] during *Kharif* season in 2019

Standard week	Whitefly population/3 leaves	Temperature (^{0}C)		Humidity (%)		Rainfall (mm)	Wind Velocity (Km/hr)	Sunshine (hr/day)
		Max.	Min.	Morning	Evening			
32	00.00	34.82	27.54	92.42	56.28	6.60	1.35	3.80
33	00.00	35.08	28.05	94.71	56.42	6.85	1.81	6.05
34	00.00	33.15	27.08	94.28	62.28	23.97	1.42	2.31
35	01.65	34.65	27.88	91.14	58.85	8.74	1.47	5.60
36	03.50	35.14	28.20	68.57	58.14	3.54	1.54	5.97
37	04.45	33.60	28.54	92.42	66.28	19.80	1.26	5.85
38	07.60	33.54	27.34	92.14	65.28	5.05	1.37	3.51
39	08.85	30.25	26.25	94.57	77.42	31.74	1.36	2.20
40	10.75	30.74	22.82	93.28	67.71	17.51	1.26	1.91
41	11.20	34.44	25.08	90.57	49.14	0.91	1.25	7.74
42	12.65	33.17	24.71	90.71	60.14	00.00	1.38	5.34
43	11.80	32.31	22.51	90.57	62.85	00.00	1.32	0.65
44	10.10	33.34	21.60	90.42	57.71	00.00	1.02	00.00
45	08.30	32.42	19.88	90.42	58.57	00.00	1.06	00.00
	r =	-0.568	-0.693	0.047	0.156	-0.279	-0.578	-0.295
	T Cal	2.389	3.334	0.164	0.549	1.008	2.452	1.07
	T Tab	2.179	2.179	2.179	2.179	2.179	2.179	2.179
	F test	S	S	NS	NS	NS	S	NS

Table 2: Field efficacy of certain insecticides on Whitefly, *Bemisia tabaci* (Gen) on Okra, First spray

S. No	Treatments	Concentration/ Dose (ml/lit)	Mean of the three replications					%Reduction over control
			1DBS	3DAS	7DAS	14DAS	Mean	
T_1	Imidacloprid 17.8 SL	0.3	6.530 (2.55)	1.420 (1.19)	1.263 (1.12)	1.950 (1.39)	1.543 (1.23)	79.79%
T_2	Buprofezin 25 SC	0.6	7.060 (2.65)	2.350 (1.53)	2.063 (1.43)	4.330 (2.07)	2.913 (1.68)	61.81%
T_3	Dimethoate 30 EC	1.5	6.887 (2.62)	1.907 (1.38)	1.753 (1.31)	2.930 (1.71)	2.193 (1.47)	71.25%
T_4	Malathion 50 EC	2	6.930 (2.63)	2.133 (1.45)	1.883 (1.37)	3.330 (1.82)	2.447 (1.55)	67.97%
T_5	Azadirachtin 1% EC	2	7.020 (2.64)	2.307 (1.51)	1.907 (1.37)	3.930 (1.98)	2.710 (1.62)	64.43%
T_6	Fipronil 5% SC	2	6.750 (2.59)	1.597 (1.26)	1.553 (1.24)	2.487 (1.57)	1.873 (1.36)	75.45%
T_7	Spinosad 45 SC	1	7.287 (2.69)	2.573 (1.60)	2.460 (1.56)	4.753 (2.10)	3.260 (1.78)	59.56%
T_0	Control	-	6.820 (2.61)	7.283 (2.69)	7.683 (2.77)	7.907 (2.81)	7.620 (2.76)	-
F-test		-	NS	S	S	S	S	-
S.Ed(±)		-	0.486	0.231	0.255	0.267	0.337	-
C.D (P=0.05)		-	N/A	0.485	0.553	0.579	0.727	-

Figures in parentheses are square root transformed values; NS=Non-significant, S= Significant, DBS=Days before spray, DAS=Days after spray

Table 3: Field efficacy of certain insecticides on Whitefly, *Bemisia tabaci* (Gen) on Okra, Second spray

S. No	Treatments	Concentration/ Dose (ml/lit)	Mean of the three replications					%Reduction over control
			1DBS	3DAS	7DAS	14DAS	Mean	
T_1	Imidacloprid 17.8 SL	0.3	4.777 (2.18)	1.687 (1.29)	1.353 (1.16)	1.577 (1.25)	1.533 (1.23)	82.90%
T_2	Buprofezin 25 SC	0.6	7.043 (2.64)	2.553 (1.59)	2.377 (1.54)	3.173 (1.78)	2.697 (1.63)	69.94%
T_3	Dimethoate 30 EC	1.5	6.130 (2.47)	2.150 (1.46)	1.730 (1.31)	2.197 (1.47)	2.023 (1.42)	77.43%
T_4	Malathion 50 EC	2	6.573 (2.56)	2.243 (1.49)	1.797 (1.33)	2.530 (1.58)	2.187 (1.47)	75.64%
T_5	Azadirachtin 1%EC	2	6.753 (2.58)	2.377 (1.54)	2.107 (1.45)	2.707 (1.64)	2.390 (1.54)	73.29%
T_6	Fipronil 5% SC	2	5.420 (2.30)	1.863 (1.36)	1.507 (1.22)	1.753 (1.31)	1.703 (1.30)	81.00%
T_7	Spinosad 45 SC	1	7.267 (2.69)	2.953 (1.71)	2.377 (1.54)	3.907 (1.97)	3.073 (1.74)	65.69%
T_0	Control	-	8.307 (2.87)	8.797 (2.96)	8.943 (2.99)	9.130 (3.02)	8.953 (2.99)	-
F-test		-	NS	S	S	S	S	-
S.Ed(±)		-	0.998	0.218	0.201	0.254	0.205	-
C.D (P=0.05)		-	N/A	0.472	0.436	0.550	0.443	-

Figures in parentheses are square root transformed values; NS=Non-significant, S= Significant, DBS=Days before spray, DAS=Days after spray

Table 4: Field efficacy of certain insecticides on Whitefly, *Bemisia tabaci* (Gen) on Okra (first and second spray pooled mean)

S. No	Treatments	Concentration/ Dose (ml/lit)	Mean of the three replications			%Reduction over control
			1-Spray	II-Spray	Overall mean	
T_1	Imidacloprid 17.8 SL	0.3	1.543 (1.23)	1.533 (1.23)	1.538 (1.23)	81.52%
T_2	Buprofezin 25 SC	0.6	2.913 (1.8)	2.697 (1.63)	2.800 (1.67)	66.18%
T_3	Dimethoate 30 EC	1.5	2.193 (1.47)	2.023 (1.42)	2.105 (1.45)	74.63%
T_4	Malathion 50 EC	2	2.447 (1.55)	2.187 (1.47)	2.310 (1.51)	72.10%
T_5	Azadirachtin 1%EC	2	2.710 (1.62)	2.390 (1.54)	2.550 (1.59)	69.20%
T_6	Fipronil 5% SC	2	1.873 (1.36)	1.703 (1.30)	1.785 (1.33)	78.50%
T_7	Spinosad 45 SC	1	3.260 (1.78)	3.073 (1.74)	3.165 (1.77)	61.83%
T_0	Control	-	7.620 (2.76)	8.953 (2.99)	8.285 (2.87)	-
F-test		-	S	S	S	-
S.Ed(±)		-	0.337	0.205	0.386	-
C.D (P=0.05)		-	0.727	0.443	0.924	-

Figures in parentheses are square root transformed values; NS=Non-significant, S= Significant, DBS=Days before spray, DAS=Days after spray

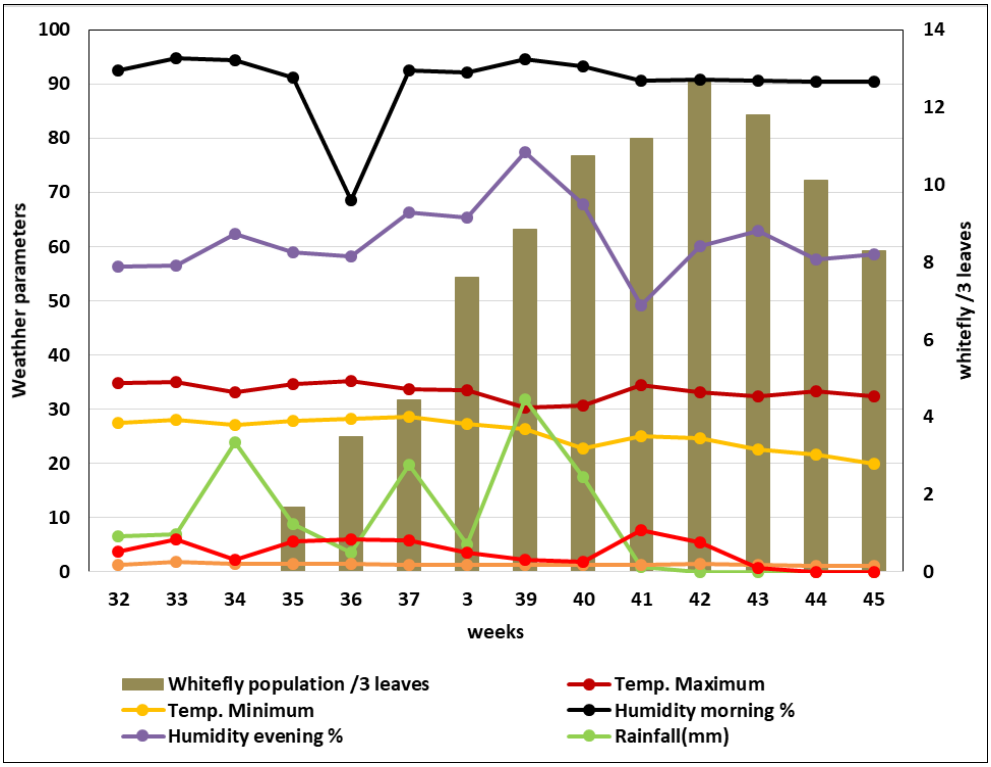

Fig 1: Population dynamics of whitefly [*Bemesia tabaci* (Gen)] during *kharif* season 2019.

Results of the study on the efficacy of certain insecticides against whitefly population are presented in Table 2, 3 and 4. The mean data of all observations regarding the efficacy of different treatments against whiteflies revealed that, all the treatment were significantly effective over the control in reducing the pest population Imidaclporid (1.53 whitflies /3 leaves) recorded lowest population with higher percent reduction (81.52%) followed by Fipronil (1.78 whitflies /3

leaves) (78.50%), followed by next effective treatment dimethoate (2.10 whiteflies /3 leaves) (74.63%), Malathion (2.31 whitflies /3 leaves) (72.10%) are at par with each other, followed by treatment Azadirachtin (2.55 whitflies /3 leaves) (69.20%), Buprofezin (2.80 whitflies /3 leaves) (66.18%), Spinosad (3.16 whitflies /3 leaves) (61.83%).

These findings are in accordance with the findings of Palumbo *et al.,* (2001) [11] reported that Imida cloprid, the first nicotinoid registered, has been largely responsible for the sustained management of *Bemisia tabaci* in horticultural production systems worldwide. Kumar and Kumar (2017) [7] reported that Imidacloprid 17.8SL was the most effective treatment indicating recorded lowest population of whitefly (1.33), Fipronil (2.06) and Dimethote30EC (2.18). Hemadri *et al.,* (2018) [6] stated that, foliar spray of Imidacloprid 17.8 SL @ 0.5 ml/l was found to be most effective against whiteflies with higher percent reduction of pest population (84.54%). Mohan and Katiyar (2000) [9] stated that confidor (Imidacloprid) was the most effective in suppressing the whitefly population. Sarkar *et al.,* (2016) [13] reported that overall best performance of insecticides against whitefly was recorded in Imidacloprid treated plots with lowest mean population of whitefly (3.91). Begum and patil (2016) [3] noted that imidacloprid 17.8SL was the most effective treatment indicating reduction in population of leafhoppers (3.58) and whiteflies (2.7) and least effective was Spinosad 45 SC with population of leafhoppers (6.32) and whiteflies (5.72).

4. Conclusion

The overall results of the present study revealed that the whitefly maximum population was recorded in the second week of October. This may be probably due to the favorable weather conditions prevailing for the pest during month. Imidacloprid 17.8 SL was found to be superior with a least population followed by Fipronil, Dimethoate and all other treatments stood well superior to the control. Thus, this knowledge of population dynamics of the pests and the insecticides will the in devising the sustainable pest management strategy for the farmers.

5. Acknowledgement

I am very thankful to our advisor and head of department for making available the necessary facilities to conduct study.

6. References

1. Acharya S, Mishra HP, Dash D. Efficacy of insecticides against okra jassid (*Amrasca biguttula biguttula* Ishida). Annals of Plant Protection Science 2002;10(2):230-232.
2. Anurag P, Chandrakar G. Studies on the Seasonal Incidence of Major Insect Pests and its Natural Enemies on Okra and Their Correlation with Weather Parameters. International journal of current microbiology and applied sciences 2018;6:204-210.
3. Begum K, Patil S. Evaluation of Newer Molecules of Insecticides Against Sucking Pests complex Infesting Okra. Indian journal of applied research 2016,6(2).
4. Fleming R, Ratnakaran. Evaluating single treatment data using Abbot's formula with modification. Journal of Economic Entomology 1985;78:1179.
5. Ghosh SKR. Incidence of white fly (*Bemisia tabaci* Genn.) and their sustainable management by using biopesticides. Building Organic Bridges 2014;4(2):623-626.
6. Hemadri T, Kumar LV, Somu G, Moulya MR. Management of whitefly, *Bemicia tabaci* in okra (*Abelmoschus esculents* L.) through new insecticide molecules. International Journal of Chemical Studies 2018;6(2):691-694.
7. Kumar KNP, Kumar A. Efficacy of selected Insecticides against sucking insect pests [*Amrasca biguttula biguttula* (Ishida) and *Bemisia tabaci* (Gennadius)] of Okra [*Abelmoschus esculentus* (L.) Moench]. International Journal of Current Microbiology and Applied Sciences 2017;6(8):3256-3259.
8. Meenambigai C, Bhuvaneswari K, Mohan, K, Sangavi, R. Pesticides usage pattern of okra, *Abelmoschus esculentus* (L) Moench in Tamil Nadu. Journal of Entomology and Zoology Studies 2017;5(6):1760-1765.
9. Mohan M, Katiyar KN. Impact of different insecticides used for bollworm control on the population of jassid and whitefly in cotton. Journal of Pesticide Research 2000;12:99-102.
10. Mohapatra LN. Population dynamics of sucking pests in *hirsutum* cotton and influence of weather parameters on its incidence in westerm Orissa. Journal of Cotton Research and Development 2008;22(2):192-194.
11. Palumbo JC, Howorowitz AR, Prabhaker N. Insecticidal control and resistance management for *Bemisia tabaci*. Crop Protection 2001;20:739-765.
12. Peirce LC. Vegetables: Characteristics, Production and Marketing. John Wiley and Sons, Canada 1987,399-401.
13. Sarkar S, Patra S and Samanta A. Efficacy of different bio-pesticides against sucking pests of okra (*Abelmoschus esculentus* L. Moench). Journal of Applied and Natural Science 2016;8(1):333-339.
14. Singh SK, Thakur S. Influence of weather parameters on population dynamics of whitefly *Bemisia tabaci* (Gennadius) in okra *Abelmoschus esculentus* (L.) Moench. Journal of Entomology and Zoology Studies 2018;6(5):2481-2483.
15. Srinivasa R, Rajendran R. Joint action potential of neem with other plant extracts against the leaf hopper *Amrasca devastance* (Distant) on okra. Pest Mange. Econ. Zool 2003;10:131-136.
16. Tripathi KK, Govila OP, Warrier R, Ahuja V. Biology of *Abelmoschus esculentus* L. (Okra). Series of Crop Specific Biology Documents. 35pp. Department of Biotechnology, Ministry of Science & Technology & Ministry of Environment and Forest, Govt. of India 2011.