Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(4): 888-891

Received: 29-05-2018
Accepted: 30-06-2018

Challa Nalini
Department of Entomology, Sam Higginbottom university of Agriculture, Technology & Sciences, Allahabad, India

Ashwani Kumar
Department of Entomology, Sam Higginbottom university of Agriculture, Technology & Sciences, Allahabad, India

Correspondence
Challa Nalini
Department of Entomology, Sam Higginbottom university of Agriculture, Technology & Sciences, Allahabad, India

Population dynamics and comparative efficacy of certain chemicals and biopesticides against okra sucking pests

Challa Nalini and Ashwani Kumar

Abstract

The present trail was conducted to study population dynamics and efficacy of certain insecticides against sucking pests of okra during kharif season 2015. Results showed that the population of whitefly *Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula*) has positive correlation with maximum temperature. Occurrence of whitefly and leafhopper commenced from 35th standard week (August third week) and then the population gradually increased and reached to its peak by 41st standard week (October second week) where after a decline in population was observed as temperature decreased. Dimethoate 30EC was found to be superior with a least population of 2.77 (whiteflies/3leaves) and 2.45 (leafhoppers/3leaves) respectively, followed by Spinosad 3.20 (whiteflies/3leaves), 3.34 (leafhoppers/3leaves), and all the treatments were found to be superior over the control.

Keywords: Biopesticides, chemical insecticides, whitefly, leafhopper, okra

Introduction

Okra is one of the most important vegetable grown throughout the tropics and warmer parts of the temperate zone [13]. The nutritional value of 100g of edible okra is characterized 1.9 g protein, 0.2 g fat, 6.4 g carbohydrate, 0.7 g minerals and 1.2 g fibers [7]. India ranks second in terms of vegetable production in the world with the production of about 162897 thousand MT [4] while it occupies the first position in okra production which is about 67% of the total world's production. In India crop occupies an area of 530.8 thousand hectare, while the production and productivity of crop in India is area, 6350.3 thousand MT and 12 MT/ha, respectively [4]. The major okra producing states are Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh and Karnataka. [10] Among all the pests that attack okra sucking pests like whitefly (*Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula)* are quiet serious. Considering the limitations of using chemicals alone, the present study was conducted to find out the efficacy of the chemicals and biopesticides and their combinations to minimise the hazardous effects of the chemicals, emphasising the importance of biopesticides as a component of IPM. A brief study of the population dynamics of the pests was also carried out

2. Materials and methods:

The present experiment was conducted during Kharif season 2015 at the Field of Horticulture of SHUATS, Allahabad, Uttar Pradesh, India. Okra seeds of variety VRO-6(Kashi Pragathi) were sown at a spacing of 45x30cm and by placing 2-3 seeds per hill and followed all recommended package of practices excluding plant protection.

The experiment was laid out in a randomised block design with nine treatments replicated three times. The observations of population dynamics of the sucking pests were made at weekly interval starting from the appearance of the pest. The observation of the pests were recorded from three leaves each from top, middle and lower part five randomly selected plants from every plot. The data was statistically analysed by correlation analysis between weather parameters and sucking pests. The insecticide treatments include Neemoil@3%, Spinosad 45%SC@0.005ml/L, *Metarhizium anisopliae*@4g/L, *Verticilium lecanii*@4/L, Dimethoate30EC@2ml/L,Cypermethrin10EC@2ml/L,Dimethoate+Neemoil,Cypermethrin+Neemoil, along with untreated control. Two sprays were done at 20 days time interval after population reaching its ETL. The observation on the incidence of the pest was recorded one day before spray and 3, 7, and 10 days after each insecticidal application. The data thus obtained were converted to average population per leaf and subjected to the standard procedures in agriculture statistics by [6]. The interpretation of data was done by using the critical difference value calculated at 0.05 probability level. The level of significance was expressed at 0.05 probability. The F-test was used to determine the significant difference. Standard error (S.E.) and critical difference (C.D.) values are calculated by using the following formula:

C.D = S.E (m) x (t) Error D.F. at 5%

$$S.E.\ (m) = \sqrt{\frac{2xMSSE}{r}}$$

3. Results and Discussion

Results on the incidence of whitefly (*Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula),* population with weather parameters are given Table1. The incidence of whitefly (*Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula)*,on okra during kharif season 2015 commenced from 28 days after sowing i.e. 35th standard week (August third week) with the average population of 1.51(whiteflies/3leaves) and 0.55(leafhoppers/3leaves) respectively,

Later the population gradually increased and reached to its peak level by 41st standard week (October second week) with an average population of 17.67(whiteflies/3leaves) and 14.36(leafhoppers/3leaves) respectively. The present results are in accordance to the work of some earlier researchers [17] who also observed that whitefly population was high during the end of September and early October. Thereafter, declining trend was observed in population of whitefly and leafhopper, reached it's lowest of 2.19(whiteflies/3leaves) and 1.10(leafhoppers/3leaves) by 48th standard week. Researchers [4] also reported that the population of *A. bigutulla bigutulla* and *Bemisia tabaci* was recorded maximumin the last week of September and first week of October. Similarly researchers [3] observed peak incidence of leafhoppers, whiteflies was noticed during last week of June 06 (16.99 leafhoppers/3 leaves), last week of April 06 (14.91 whiteflies/3 leave). Researchers [15] who also reported that okra at 7 to14 weeks was most susceptible to leafhopper (i.e. plant nearing maturity seems to be more susceptible) than other stages as observed in the present case.

The result on efficacy of certain chemicals and biopesticides on sucking has been presented in Table2. The result revealed that all the insecticides proved significantly effective in controlling the sucking pests over untreated plot as evidence from data collected on its incidence.Incidence of leaf hopper assessed in various treatments during first spray revealed that Dimethoate (2.813 hoppers/3leaves) proved significantly effective in reducing the population of the pest, whereas *Metarhizium anisopliae* (10.032 hoppers/3leaves), is found less effective. Similar pattern of treatment effect was noticed during second spray as well. The pooled data also indicated significant difference in population of leaf hopper; however, minimum (2.45 4hoppers/3leaves) numbers were registered in Dimethoate treated plots followed by Spinosad (3.345 hoppers/3leaves), Cypermethrin (3.575 hoppers/3leaves) both the combination products, Dimethoate +Neemoil (5.115 hoppers/3leaves), Cypermethrin + Neemoil (5.335 hoppers/3leaves) proved moderately effective against leaf hopper.The superiority of Dimethoate against okra leaf hopper revealed in present study tends to support with the reports of researchers [5, 12] also reported that dimethoate was also effective against okra sucking pests including leafhoppers, aphids. The present results were also found similar to the findings of some prior researchers [8, 15].

Incidence of whitefly (*Bemesia tabaci*) assessed in various treatments during first spray revealed that Dimethoate (3.256 whiteflies/3leaves) proved significantly effective in reducing the population of the pest, whereas *Metarhizium anisopliae* (8.983 whiteflies/3leaves), is found less effective. Similar pattern of treatment effect was noticed during second spray as well. The pooled data also indicated significant difference in population of leaf hopper; however, minimum (2.775 whiteflies/3leaves) numbers were registered in Dimethoate treated plots followed by Spinosad (3.205 whiteflies/3leaves), Cypermethrin (4.165 whiteflies/3leaves) both the combination products, Dimethoate +Neemoil (5.075 whiteflies/3leaves), Cypermethrin + Neemoil (5.935 whiteflies/3leaves) proved moderately effective against leaf hopper.The superiority of Dimethoate against whitefly revealed in present study tends to support with the reports of researchers [9, 12, and 17] who studied the effectiveness of Dimethoate against *Bemesia tabaci* infesting okra, which is in agreement with the present findings.Dimethoate to be highly effective against all stages of whiteflies recording 90 percent nymphal, 80 percent pupal, 95 percent adult mortality. [18], and other researchers [11, 2, and 1] also reported that treatment with Dimethoate showed a drastic reduction whitefly and leafhopper and other sucking pest population.

Table 1: Population dynamics of whitefly (*Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula),* of okra during *kharif* season 2015

Standard week	Whitefly	Leaf hopper	Temperature		Humidity %		Rainfall (mm)	Wind Velocity	Sunshine (hr/day)
			Max.	Min.	Morning	Evening			
32	0.00	0.00	34.08	27.74	90.57	55.42	2.20	1.33	5.82
33	0.00	0.00	35.97	27.51	92.42	53.42	5.00	1.28	5.34
34	0.00	0.00	33.22	27.00	92.85	58.28	12.48	2.22	4.80
35	1.51	0.55	35.45	27.42	90.71	54.85	11.85	2.55	5.74
36	3.55	1.45	36.42	27.20	89.71	45.42	0.00	1.68	7.97
37	6.48	4.33	37.48	27.37	86.71	47.14	0.00	2.17	8.70
38	9.62	6.59	35.65	28.05	86.28	55.71	0.60	1.17	7.11
39	12.94	9.21	36.11	27.80	90.71	47.14	0.20	1.84	7.17
40	15.71	13.37	35.77	27.85	89.00	50.14	0.00	1.56	8.45
41	17.67	14.36	36.42	27.82	90.85	51.57	0.00	1.35	8.68
42	16.82	13.92	35.85	23.88	78.28	51.40	0.00	0.96	8.57
43	16.04	10.74	36.00	20.57	93.00	50.71	0.00	0.71	8.65

44	14.79	7.23	35.25	19.71	91.57	29.71	0.64	0.51	6.65
45	9.21	4.51	33.57	20.08	90.71	57.00	0.00	0.48	8.31
46	7.54	3.76	32.57	19.48	90.71	59.57	0.00	0.49	8.42
47	4.26	2.49	33.60	16.02	91.14	52.85	0.00	0.61	8.17
48	2.19	1.10	31.42	12.00	90.85	53.42	0.00	0.57	8.28
		r=	0.379	0.111	-0.372	-0.259	-0.520	-0.141	0.616
		t=	1.531	0.417	-1.502	-1.002	-2.277	-0.531	2.929

Table 2: Efficacy of certain chemicals and biopesticides on whitefly (*Bemesia tabaci)* and leafhopper (*Amrasca biguttula biguttula),* of okra.

Treatments		Dose	Number of whiteflies/3leaves			Number of hoppers /3leaves		
			I Spray Mean	II Spray mean	Pooled Mean	I Spray mean	II Spray mean	Pooled Mean
T_0	Untreated	-	17.1	17.6	17.4	14.3	14.4	14.3
T_1	Neemoil	3 ml/L	8.2	8.3	8.2	9.1	4.5	6.8
T_2	Spinosad	0.05 ml/L	3.68	2.72	3.20	3.77	2.91	3.3
T_3	*Metarhizium anisopliae*	4 g/L	8.98	8.64	8.81	10.03	4.96	7.49
T_4	*Verticilium lecanii*	4 g/L	8.63	8.40	8.52	9.50	4.63	7.06
T_5	Cypermethrin	2 ml/L	4.13	4.19	4.16	4.14	3.01	3.57
T_6	Cypermethrin+Neemoil	1+1.5 ml/L	6.38	5.49	5.93	6.74	3.92	5.33
T_7	Dimethoate	2 ml/L	3.25	2.29	2.77	2.81	2.09	2.45
T_8	Dimethoate+ Neemoil	1+1.5 ml/L	4.89	5.26	5.07	6.46	3.77	5.11
Overall mean		-	7.26	7.00	7.13	7.44	4.92	6.18
S. Ed. (±)		-	0.24	0.20	0.43	0.31	0.12	1.51
C. D. (P = 0.05)		-	0.52	0.43	0.92	0.67	0.27	3.21

4. Conclusion
The overall results of the present study revealed the fluctuation in the population of sucking pests i.e., whitefly and leafhoper in each month with the maximum population being recorded in the second week of October. This may be probably due to the favorable weather conditions prevailing for the pests during these months. Dimethoate30EC was found to be superior with a least population followed by Spinosad 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. Acknowledgment
The authors are thankful to all the faculty members of Entomology Department, College of Agriculture, SHUATS, for their support and to the coordination of department of horticulture, for providing field and the necessary facilities during the course of study.

6. References
1. Ahmad RB, Mughal AH. Bioefficacy of Insecticides against alfalfa weevil, *Hypera variabilis* larvae in Kargil" Indian Journal of Plant Protection. 2010; 38:1.
2. Anand N, Kotikal YK, Balikai RA. Management practices for major sucking pests of pomegranate. Karnataka Journal of Agriculture Science. 2009; 22:790-795.
3. Anitha KR, Nandihalli BS. Bioefficacy of newer insecticides against leafhopper and aphid in okra. Karnataka Journal of Agricultural Sciences. 2009 22(3):714-715.
4. Babita B, Karnatak AK. Population dynamics of sucking pests and their predators on okra agroecosystem. Journal of Entomology and Zoology Studies. 2018; 6(2):1289-1291.
5. Boopathi T, Pathak KA, Ngachan SV, Das. N. Field efficacy of different neem products and insecticides against *Aphis gossypii* (GLOV) on okra. Pestology. 2010; 34(6):48-51.
6. Gomez KA, Gomez AA. Statistical procedure for agricultural research. An International Rice Research Institute Book. 1984; A Wiley-interscience Publication, Johan Wiley and Sons, Inc.
7. http://www.ncpahindia.com/okra,php.
8. Kooner BS, Cheema HK, Taggar GK. Efficacy of different insecticides as foliar sprays against bean thrips, *Megalurothrips distalis* (Karny) in mungbean. ISHS Acta Horticulturae. 2006; 752:234.
9. Misra HP, Dash DD, Mahapatra D. Efficacy of some insecticides against okra fruit borer, *Earias* spp and leaf roller, *Sylepta derogata* Fab. Annals of Plant protection Sciences. 2002; 10:51-54.
10. Pal S, Maji TB, Mondal P. Incidence of insect pests on okra, *Abelmoschus esculentus* (L) Moench in red lateritic zone of West Bengal. Journal of Plant Protection science. 2013; 5:59-64.
11. Palthiya RV, Nakat ND, Tamboli, Laxman G. Efficacy of entomopathogenic fungi on whiteflies of okra. International Journal of Tropical Agriculture. 2015; 33:2.
12. Pareek BL, Sharma GR, Bhatnagara KN. Field evaluation and economics of insecticides against the major pests of okra. International Journal of Pest management. 1987; 33:192-195.
13. Saeed HB, Neela B. Nutrient profile, bioactive components, and functional properties of okra (*Abelmoschus esculentus* (L.) Moench). Fruits, Vegetables, and Herbs. Bioactive Foods in Health Promotion. 2016; 18:365-409.
14. Saleem E, Khalid M, Moazzam AK, Ashif S, Zahid M, Aamir A, Habibulla R. Efficacy and residual persistence of organophosphate pesticides against thrips on okra (*Abelmoschus esculentus L*). Bulletin of Environment Pharmacology and Life sciences. 2014; 3(5):178-184.
15. Senapathi B and Khan SR. A note on population fluctuation of *Amarasca biguthula biguthula* (Ishida) on Okra at Bubaneshwar. Indian Journal of Agriculture Research. 1978; 12:97-98.
16. Sharma P, Rishi N. Population build up of the cotton whitefly, *Bemisia tabaci* Genn. in relation to weather

factors at Hisar, Haryana. Pest mangement and economic zoology. 2004; 12(1):33-38.

17. Shivanna BK, Gangadhara BN, Nagaraja MK, Basavaraja, KS, Karegowda C. Bio efficacy of new insecticides against sucking insect pests of transgenic cotton. International journal of science and nature. 2011; 2(1):79-83.
18. Thimmaiah AG. Use of insecticides in combination with oils for the management of spiralling whitefly *Aleurodicus disperses* Russell on Guava. *M.Sc. (Agri.) Thesis*, University of Agriculture Sciences, Dharwad (India), 2002.