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Seasonal Incidence of Whitefly, Bemiciatabaci (aleyrodidae: hemiptera) on Different Genotypes of Okra, Correlated with Ecological Parameters

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Abstract

Studies on the seasonal incidence of Whitefly, Bemiciatabaci, (Aleyrodidae: Hemipetra) on Okra were carried out in correlation with ecological parameters on the population build up of the pest. Studies revealed that the incidence of the Whitefly started in the third week of February and persisted throughout, on all the varieties. Whereas, the varieties ArkaAbhay (V1) and VRO-5 (V4), showed minimum build-up of Whitefly population throughout the season, showing maximum incidence in the month of April, as compared to the other varieties. The incidence started from the secondand fourthweek of March and, reached its peak in the second and first week of April and continued to decline till the maturation of the crop on the varieties, ArkaAbhay (V1) and VRO-5 (V4) respectively. The pest incidence was found to be maximum, when maximum and minimum temperature ranged from 41.10 to 20.70^{0}C and 40.50 to 18.30^0 C and relative humidity ranged from 61 to 15% and 57 to 14% on the varieties,ArkaAbhay (V1) and VRO-5 (V4) respectively.Positive and significant correlation existed between maximum temperature and negative and significant correlation existed between maximum relative humidity and Whitefly population on both the varieties.

Keywords : ***Bemiciatabaci, seasonal incidence, correlation, Okra.***

Introduction

Okra (*Abelmoschusesculentus* (L.) Moench), is cultivated in tropical, subtropical and warm temperate regions all around the world (National Research Council 2008-2015). In India okra is being cultivated around the year in *Kharif,Rabi and Zaid* seasons. Where, production of Okra in India is 5784 thousand tones and productivity is 11.1 tones/hectare. (Indian Horticulture database 2011)On the other hand, Incidence of various insect pests is one of the prime constraint in the production of the crop. Amongst which Whitefly, *Bemiciatabaci*(Aleyrodidae: Hemiptera) has emerged as a very important insect pest of Okra, not only causing wilting but also acting as a vector for Yellow vein clearing mosaic disease, whichis one the most important and destructive viral disease in Okra that infects crop at all the stages of growth. The fruits of the infected plants become pale yellow to white in color, deformed, small and tough in texture. The disease causes 50-100% loss in yield and quality if the plants get infected within 20 days after germination.(Rashid *etal.,* 2002;Givord and Denboer1980;Sastry and Singh 1974). However, Insect Pest Management (IPM) strategies involve minimum use of pesticides thereby, reducing environmental pollution anddevelopment of pesticide resistance in the insect pests, (Headley 1979). Moreover, screening and developing resistant varieties is one of the most economical and effective method for the management of various agricultural insect pests. Thus, an effort was madewhere different promising varieties of Okra were screened against *Bemiciatabaci*, in Zaid season.

Materials and Methods

Eleven varieties of Okra including Check were collected from IIVR Varanasi and were investigated for the incidence ofwhitefly *(Bemisiatabaci).* Field experiment was conducted at Agricultural Research farm at Sam Higginbottom Institute of Technology and Sciences, Allahabad, fromFebruary to May 2015.

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The experiment was laid out in Randomised Block Design (RBD) with three replications. The observations were recorded at weekly intervals from randomly selected and tagged 20 plants. The data recorded was from five leaves *viz.* two from the bottom, two from the middle and one from the top of the selected and labeled plants. The first observation was taken as soon as the whitefly population was noticed on the plants and continued till the last harvesting of the crop. The data collected were averaged/ plant basis and correlation with weather parameters was done to know the population dynamics of the insect pest occurring on Okra. During the period of observations, minimum and maximum temperature, relative humidity, sunshine hours, wind velocity and rainfall during the course of investigation were collected from the meteorological observatory laboratory. They were correlated with the population build-up of the insect pest.

The data obtained was analysed statistically, using "Analysis of Variance". The f-test was used to determine the significant difference. (Gomez and Gomez, 1984).

Results and Discussion

The incidence of *Bemiciatabaci* commenced from the 4th week of February and was observed tillthe 4th week of May, 2015. The pre-ponderence of whitefly might be due to congenial weather conditions thatprevailed during the study, viz., 33.8^{0}C to 41.9^{0}C, maximum and 15.1^{0}C to 24.1^{0}C minimum temperature, while 67 to 77% of maximum and 26 to 33% of minimum relative humidity, and precipitation of 28.22mm received from 3rd week of April (16th standard week) respectively (Table 4). Maximum incidence of the pest on the varieties was observed from 3rd week of March which persisted till the 4th week of May. It was observed that whitefly incidence was higher on all the varieties when maximum and minimum temperature ranged from 35.20 to16.9^{0}C and 39.8 to 22.8^0 C respectively and relative humidity ranged from 66 to 17 per cent and 68 to 38 per cent respectively.On the other hand, all the varieties showed significant low incidence of whitefly as compared to the check, PrabhaniKranti (V11).Further, with the increasing order of pest incidence and their correlation with weather parameters, it was observed that thevariety ArkaAbhay(V1), showed infestation from the second week of March with a maximum incidence of only 0.44 average whitefly population/leaf in the second week of April (Table 1)and showed that maximum temperature had positive significant influence (r= 0.780431)while maximum relative humidity had negative significant influence

(r= -0.75035)on the whitefly population (Table 2). Banadyopadhyay*etal*., (2005). However, the mean population of the insect in the entire season was 0.22 fly/ leaf respectively (Table 3). This was followed by the variety VRO-5 (V4), showed Whitefly incidence from fourth week of March with maximum mean infestation of 0.68 in the first week of April (Table 1). The population showed significant positive correlation with maximum temperature (r= 0.698458) and significant negative correlation with maximum relative humidity (r= -0.61931) respectively (Table 2). However, the mean population of the insect in the entire season was 0.35 fly/leaf respectively (Table 3).The findings are in concurrence with the findings of Mondol and Kumar (2012).The variety Punjab-7 (V10) showed Whitefly incidence from second week of March with maximum mean infestation of 0.72 in the first week of May (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.815291) and relative humidity (r = 0.78737) respectively (Table 2). However, the mean population of the insect in the entire season was 0.4 fly/leaf respectively (Table 3). The variety LORM-1 (V3) showed Whitefly incidence from fourth week of March with maximum mean infestation of 0.81 in the fourth week of April (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.770594) and significant negative correlation with maximum relative humidity (r = -0.507702) respectively (Table 2). However, the mean population of the insect in the entire season was 0.42 fly/leaf respectively (Table 3). Further, the variety VRO-6 (V5), showed Whitefly incidence from fourth week of March with maximum mean infestation of 0.85 in the first week of April (Table 1). The population showed significant positive correlation with maximum temperature (r =0.719069) and significant negative correlation with maximum relative humidity (r = -0.67027) respectively (Table 2). However, the mean population of the insect in the entire season was 0.453 fly/leaf respectively (Table 3). The variety HissarUnnat (V6), showed Whitefly incidence from first week of March with maximum mean infestation of 0.87 in the first week of April (Table 1). However, the mean population of the insect in the entire season was 0.47 fly/leaf respectively (Table 3).

Whereas, the variety PusaMakhamali (V9), showed Whitefly incidence from third week of February with maximum mean infestation of 0.89 in the fourth week of April (Table 1). The population showed significant positive correlation with maximum and minimum temperature (r = 0.820137; r=0.650585) and significant negative correlation with maximum relative humidity (r = -0.69847) respectively (Table 2). However, the mean population of the insect in the entire season was 0.476 fly/leaf respectively (Table 3). Further, the variety D-1-87-5 (V8) showed Whitefly incidence from second week of March with maximum mean infestation of 0.89 in the third week of March itself (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.708593) and significant negative correlation with maximum relative humidity (r = -0.67815) respectively (Table 2). However, the mean population of the insect in the entire season was 0.51 fly/ leaf respectively (Table 3). The variety VarshaUphar (V7) showed Whitefly incidence from second week of March

with maximum mean infestation of 0.96 in the fourth week of March (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.679196) and significant negative correlation with maximum relative humidity (r = -0.67929) respectively (Table 2). However, the mean population of the insect in the entire season was 0. 56 fly/leaf respectively (Table 3). The variety, PravaniKranti(V2) showed Whitefly incidence from second week of March with maximum mean infestation of 0.97 in the fourth week of April (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.699666) and significant negative correlation with maximum relative humidity (r = -0.69111) respectively (Table 2). However, the mean population of the insect in the entire season was 0.58 fly/leaf respectively (Table 3).Dhawan*etal*., (1991) observed severe infestation of *Bemiciatabaci* on Cotton cultivars. The variety PrabhaniKranti used as check, was followed by the variety showed Whitefly incidence from fourth week of March with maximum mean infestation of 0.97 in the fourth week of May (Table 1). The population showed significant positive correlation with maximum temperature (r = 0.805374) and significant negative correlation with maximum relative humidity (r = -0.49423) respectively (Table 2). However, the mean population of the insect in the entire season was 0.713 fly/leaf respectively (Table 3).

It was thus inferred that, the varieties ArkaAbhay (V1) and VRO-5 (V4), showed minimum incidence of Whitefly in the Zaid season, showing maximum incidence in the month of April. As compared to other varieties it started from the second and fourthweek of March and, reached its peak in the second and first week of April and continued to decline till the maturation of the crop.The pest incidence was found to be maximum when maximum and minimum temperature ranged from 41.10 to 20.70^{0}C and 40.50 to 18.30^0 C and relative humidity ranged from 61 to 15 per cent and 57 to 14 per cent on ArkaAbhay (V1) and VRO-5 (V4) respectively.

It can thus be concluded that from the eleven varieties tested for the incidence of Whitefly, the varieties ArkaAbhay (V1) and VRO-5 (V4) which showed relatively low pest incidence, can be recommended for the production of Okra, that will be an low investment and at the same time will provide an eco-friendly approach in Integrated pest management strategies.

Table 1. : Seasonal incidence of Whitefly on various varieties of Okra in Zaid Season, correlated with weather parameters

S.No.	Std. wk.	Date	Arka Abhay (V_1)	Parvani Kranti (V_2)	LORM-1 (V_3)	VRO-5 (V_4)	VRO-6 (V_5)	Hissar Unnat (V_6)	Varsha Uphar (V_7)	D-1-87-5 (V_8)	Pusa Makhamali (V_9)	Punjab-7 (V_{10})	Prabhani Kranti (Check)
1	7	Feb 12-18	0	0	0	0	0	0	0	0	0	0	0
2	8	9-25	0	0	0	0	0	0	0	0	0	0	0
3	9	26-4	0	0	0	0	0	0	0	0	0.19	0	0
4	10	Mar 5-11	0	0	0	0	0	0.32	0	0	0.27	0	0
5	11	12-18	0.19	0.21	0	0	0	0.38	0.47	0.46	0.32	0	0
6	12	19-25	0.25	0.33	0	0	0	0.45	0.68	**0.89**	0.40	0	0
7	13	26-1	0.33	0.52	0.39	0.44	0.63	0.63	**0.96**	1.12	0.45	0.57	0.47
8	14	Apr 2-8	0.43	1.11	1	**0.68**	**0.85**	**0.87**	0.75	1.11	0.85	0.65	0.43
9	15	9-15	**0.44**	0.49	0.67	0.32	0.45	0.79	0.61	0.41	0.52	0.48	0.59
10	16	16-22	0.16	0.35	0.64	0.27	0.27	0.57	0.91	0.53	0.55	0.6	0.65
11	17	23-29	0.4	**0.97**	**0.81**	1.01	1	0.77	0.79	1.07	**0.89**	1.23	1.55
12	18	May 30-6	0.35	0.61	0.61	0.6	0.61	0.53	0.53	0.6	0.65	0.72	1.27
13	19	7-13	0.07	0.13	0.21	0.2	0.29	0.37	0.4	0.55	0.28	0.67	0.97
14	20	14-20	0.16	0.25	0.37	0.2	0.2	0.43	0.4	0.64	0.39	**0.68**	**0.99**
15	21	21-27	0.13	0.21	0.31	0.16	0.19	0.37	0.32	0.33	0.57	0.57	0.97

Table 2. : Correlation between weather parameters and Whitefly on various varieties of Okra

Varieties		Temperature (ºC)		Relative Humidity (%)		Rainfall (mm)	Wind velocity (km/hr)	Sunshine (hrs)
		Max.	Min.	Max.	Min.			
Arka Abhay (V_1)	r	0.780431*	0.460712	-0.75035*	-0.46896	-0.02538	-0.47606	0.184563
	t	4.506025*	1.873888	-4.09774*	-1.91678	-0.09164	-1.95423	0.67792
Parvani Kranti (V_2)	r	0.699666*	0.39491	-0.69111*	-0.39092	0.012017	-0.45278	0.199093
	t	3.535201*	1.55175	-3.452*	-1.53323	0.043385	-1.83321	0.733408
LORM-1 (V_3)	r	0.770594*	0.507702	-0.72581*	-0.33325	0.234794	-0.31235	0.106954
	t	4.364872*	2.127374	-3.80895*	-1.27595	0.871984	-1.18699	0.388332
VRO-5 (V_4)	r	0.698458*	0.476748	-0.61931*	-0.25648	0.014518	-0.3953	0.194898
	t	3.523272*	1.957887	-2.8475*	-0.95795	0.052416	-1.55358	0.717337
VRO-6 (V_5)	r	0.719069*	0.454174	-0.67027*	-0.34423	-0.00875	-0.40463	0.223517
	t	3.735351*	1.840321	-3.26054*	-1.32355	-0.03159	-1.59732	0.82784
Hissar Unnat (V_6)	r	0.037931	-0.11766	-0.22178	-0.3551	-0.08798	-0.11753	0.146589
	t	0.137029	-0.42774	-0.82109	-1.3713	-0.31885	-0.42726	0.534967
Varsha Uphar (V_7)	r	0.679196*	0.46823	-0.67929*	-0.31356	0.410189	-0.09817	0.078616
	t	3.340657*	1.912967	-3.34155*	-1.19207	1.623662	-0.35612	0.284683
D-1-87-5 (V_8)	r	0.708593*	0.512415	-0.67815*	-0.29216	0.092465	-0.18491	0.150938
	t	3.625227*	2.154113	-3.33111*	-1.10283	0.335233	-0.67923	0.551203
Pusa Makhamali (V_9)	r	0.820137*	0.650585*	-0.69847*	-0.18821	0.17522	-0.35409	0.130431
	t	5.174536*	3.092587*	-3.52342*	-0.69181	0.642482	-1.3668	0.474912
Punjab-7 (V_{10})	r	0.815291*	0.78737*	-0.59906*	0.002405	0.188718	-0.10343	0.07793
	t	5.082795*	4.610704*	-2.70086*	0.008684	0.693737	-0.37541	0.282185
Prabhani Kranti (Check)	r	0.805374*	0.894757*	-0.49423	0.177748	0.137042	-0.07676	0.03567
	t	4.904795*	7.233325*	-2.05236	0.652052	0.499434	-0.27792	0.12885

Table 3. : Population of Whitefly on various varieties of Okra in Zaid Season

Variety	Average Population
Arka Abhay (V_1)	0.22
Parvani Kranti (V_2)	0.453
LORM-1 (V_3)	0.40
VRO-5 (V_4)	0.353
VRO-6 (V_5)	0.426
Hissar Unnat (V_6)	0.56
Varsha Uphar (V_7)	0.51
D-1-87-5 (V_8)	0.58
Pusa Makhamali (V_9)	0.47
Punjab-7 (V_{10})	0.476
Prabhani Kranti (Check)	0.713
F-test	S
S.E. (+)	0.067
C.D. at 5%	0.140

Table 4. : Weather Parameters

S.No.	Std. wk.	Date	Weather parameters						
			Max. Temp. (°C)	Min. Temp. (°C)	Max. R.H. (%)	Min. R.H. (%)	Rainfall (mm)	Wind velocity (km/hr)	Sunshine hours (hr)
1	7	Feb 12-18	32.05	12.25	74	28	0	2.20	9.20
2	8	9-25	34.80	13.70	70	25	0	3.08	1.10
3	9	26-4	33.80	15.10	77	26	0	3.07	8.40
4	10	Mar 5-11	31.30	15.30	84	43	0	2.87	4.94
5	11	12-18	30.10	15.50	89	40	0	2.40	7.00
6	12	19-25	35.20	15.40	66	17	0	2.58	9.40
7	13	26-1	37.20	16.90	63	16	0	2.33	8.90
8	14	Apr 2-8	40.50	18.30	57	14	0	1.80	8.94
9	15	9-15	41.10	20.70	61	15	0	2.03	8.40
10	16	16-22	36.30	18.80	68	32	28.2	3.85	7.20
11	17	23-29	39.80	22.80	67	33	0	2.04	8.80
12	18	May 30-6	41.90	24.10	61	26	1.5	1.91	8.45
13	19	7-13	40.20	25.50	69	35	6.4	4.05	8.30
14	20	14-20	39.90	25.50	68	38	0	3.68	7.10
15	21	21-27	38.30	25.60	70	41	0	1.77	8.50

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