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Effect of Abiotic Factors on the Population Fluctuation of Whitefly, *Bemisia tabaci* (Gen.) in Nectaried and Nectariless Genotypes of Cotton

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ABSTRACT

The study was conducted to determine the impact of abiotic factors on the population dynamics of whitefly on the eight Nectaried and Nectariless genotypes of cotton viz, NIAB Karishma, Karishma-1, Karishma-2, MNH-554, CIM-446, CIM-482, NIAB-86 and NIAB-98 at Nuclear Institute for Agriculture and Biology, Faisalabad. The correlation among whitefly population and weather factors showed that temperature, relative humidity and precipitation affected negatively to whitefly population on certain nectaried and nectariless genotypes of cotton. Positive correlation of whitefly population with temperature and relative humidity in NIAB-Karishma-1, with temperature only in NIAB-Karishma-2, MNH-554 and with precipitation and relative humidity in NIAB-86 was observed.

Key Words: Abiotic factors; Cotton; Whitefly; *Bemisia tabaci*

INTRODUCTION

Besides a variety of reasons of low yield of cotton, the insect pests cause heavy qualitative and quantitative losses varying from 40-50% (Naqvi, 1976). Among sucking insect pests, whitefly (*Bemisia tabaci* Genn.) is designated as key pest, responsible for CLCV and development of sooty mould on the leaves of cotton, interrupting photosynthesis and contributing for low yield. Weather factors i.e., temperature, relative humidity and precipitation play a major role for the incidence and development of whitefly. It is necessary to sort out the exact nature / degree of relationship, which exists between whitefly population and weather factors, with ultimate aim to help the entomologist to develop the best I.P.M. strategy for the control of whitefly.

Whitefly population increased with increase in temperature and relative humidity (Seif, 1980). Maximum temperature and sunshine hours were positively correlated and relative humidity was negative with the population of whitefly (Rote & Puri, 1991). Significant relationship was observed between population build up of jassid, whitefly, American and Spotted bollworm with mean air temperature and relative humidity (Bishnol *et al.*, 1996). Among the six parameters taken for study, minimum temperature and relative humidity were significantly correlated with the population of whitefly over time (Gupta *et al.*, 1998).

MATERIALS AND METHODS

Studies regarding incidence and development of whitefly in eight Nectaried and Nectariless genotypes of cotton Viz., NIAB-KARISHMA *(Nectariless)*, NIAB-KARISHMA-1 *(Nectariless)*, NIAB-KARISHMA-2 *(Nectariless)*, MNH-554, CIM-446, CIM-482, NIAB-86 and NIAB-98, were carried out during 2001 crop season at Nuclear Institute for Agricultural and Biology (NIAB), Faisalabad. The experiment was laid out in Randomized Complete Block Design with four replicates. The plot size for each treatment was 7m x 3m, row x row distance was 75 cm and length of row was 8.33m. There were five rows in each treatment. The data regarding the population of whitefly were recorded at weekly intervals, taking two leaves each from top, middle and bottom from five randomly selected plants from each replicate from July to October. Temperature, relative humidity and precipitation were recorded during the entire research work. Finally, data were statistically analyzed by applying the DMR test at 5% probability level (Steel & Torrie, 1980) and correlations between whitefly population and different weather factors was calculated.

RESULTS AND DISCUSSION

Overall mean population of whitefly in nectaried and nectariless genotypes of cotton. The data regarding the whitefly population in Table I revealed that the overall comparison of mean values of advance genotypes of cotton showed that the maximum per leaf population of whitefly of 11.09 and 10.29 was recorded on NIAB-Karishma and CIM-446, respectively which are statistically at par with each other while the minimum population of 6.24 in NIAB-Karishma-2 which is statistically different from all other varieties. However there was no significant difference among the varieties

NIAB-98, NIAB-86, CIM-482, MNH-554 and NIAB-Karishma-1 for the population of whitefly between classes A and D.

Correlation between whitefly population x weather factors and variety x weather factors. Correlation among weather factors and population of whitefly in Table II showed that there was negative correlation between air temperature, relative humidity and precipitations and the population of whitefly. Seif (1980) and Gupta (1998) reported that with increase in temperature and relative humidity, population of whitefly also increased. The findings of above mentioned authors are not in favour of present study. However, Rote and Puri (1991) and Jagdev and Butter (1988) reported that relative humidity was negatively correlated to population of whitefly. These findings are in favour of present study.

Results of correlation between variety and weather factors for whitefly population indicated that there was negative correlation among temperature, relative humidity and precipitation in nectaried and nectariless genotypes of cotton as reported by Rote and Puri (1991), except NIAB-Karishma-1 in which precipitation was negatively correlated while temperature and relative humidity were positively correlated as reported by Berlinger (1996), NIAB-86 which showed negative correlation for air temperature while relative humidity and precipitation were positively correlated and NIAB-Karishma-2 and MNH-554 in which only temperature is positively correlated for the development of whitefly.

The data regarding the population of whitefly recorded at weekly intervals, taking two leaves each from top, middle and bottom from five randomly selected plants from each replicate from July to October have been presented in Table III.

Table I. Comparison of means of population of whitefly in different nectaried and nectariless genotypes of cotton

Genotypes	Mean Values	Classes
NIAB-Karishma	11.09	A
CIM-446	10.29	A
NIAB-98	8.63	BC
CIM-482	8.40	BC
MNH-554	8.07	BC
NIAB-86	7.77	BC
NIAB-Karishma-1	7.67	C
NIAB-Karishma-2	6.24	D

Table II. Correlation coefficient values for whitefly population in Nectaried and Nectariless genotypes of cotton

Cotton genotypes	Precipitation	Air Temp	R.H%
Nectariless			
NIAB-Karishma	-0.289	-0.129	-0.048
NIAB-Karishma-1	-0.168	0.032	0.004
NIAB-Karishma-2	-0.355	0.077	-0.040
Nectarid			
MNH-554	-0.220	0.173	-0.022
CIM-446	-0.035	-0.231	-0.001
CIM-482	-0.249	-0.057	-0.026
NIAB-86	0.013	-0.259	0.041
NIAB-98	-0.160	-0.277	-0.035

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Table III. Population of whitefly on nectarid and nectariless genotypes of cotton observed from July to October

	COTTON VARIETIES									
Dates	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**TOTAL**	**MEAN**
D1	1.80	1.70	1.85	1.40	2.40	1.95	1.28	2.75	15.13	1.89
D2	2.20	1.45	2.85	1.00	3.75	2.95	3.70	3.00	20.90	2.61
D3	12.23	2.75	4.75	4.25	2.40	4.75	3.10	6.25	40.48	5.06
D4	7.20	7.00	3.35	6.25	12.40	6.30	10.45	6.75	59.70	7.46
D5	13.95	15.70	9.85	20.45	11.90	12.60	5.30	5.55	95.30	11.91
D6	17.05	11.80	12.00	12.80	9.60	13.80	11.65	14.70	103.40	12.93
D7	13.00	13.95	9.25	11.45	26.20	16.70	15.05	12.90	118.50	14.81
D8	31.85	14.40	12.15	10.00	27.95	17.75	22.95	31.10	168.15	21.02
D9	13.95	15.40	9.80	19.75	11.90	12.60	9.65	9.35	102.40	12.80
D10	12.23	3.00	4.75	4.50	10.30	4.60	4.45	3.10	46.93	5.87
D11	3.25	2.90	2.15	2.85	1.45	2.73	2.55	2.93	20.80	2.60
D12	4.40	2.03	2.15	2.10	3.05	4.03	3.10	5.13	25.98	3.25
TOTAL	133.10	92.08	74.90	96.80	123.30	100.75	93.23	103.50	817.65	
MEAN	11.09	7.67	6.24	8.07	10.28	8.40	7.77	8.63	68.14	8.52