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Seasonal dynamics of whitefly, *Bemisia tabaci* (Gennadius) on transgenic *Bt* cotton and their correlation with abiotic factors

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Abstract

The first incidence of whitefly noted during mid-July when cotton crop was on two to four true leaf stage and remained active throughout crop season. The whitefly population increased from July to September and noted peak during October month (16.78/3leaves at 43 MSW in 2011 and 16.32/3leaves at 40 MSW in 2012) when crop was in boll development stage and recorded minimum during December month when crop was in maturity phase. Maximum temperature (r=0.550) exhibited highly significant positive correlation during 2011 and non-significant positive correlation (r= 0.314) during 2012. Significant negative correlation found with rainfall (r= - 0.575) during first year but non-significant negative correlation (r= -0.330) reported during second year with whitefly population. Wind velocity remain non-significant negative correlation (r= - 0.269 and r= -0.269) during both years.

Keywords: Incidence, whitefly, true leaf stage, population, MSW, correlation

1. Introduction

In India cotton is important commercial crop grown under diverse agro-climatic conditions and known to attacked by several insect pests, of which sucking pest has assumed major pest status from last few years. In sixteen out of twenty-seven cotton producing countries, whitefly *Bemisia tabaci* (Gennadius) has been reported as a major pest during mid to late cotton growing season [1]. Whitefly is known to damage by sucking cell sap from the various plant parts and secrete honey dew [2] which leads to lint sticky and black appearance. Heavy infestation may reduce plant vigor and growth, cause chlorosis and uneven ripening of bolls. Its direct feeding induces physiological disorders resulting in shedding of immature fruiting parts. In order to develop sustainable pest management strategies, the present study planned on population dynamics of whitefly under prevailing agro-climatic conditions in view of changing scenario of pest incidence and introduction of improved technology/hybrids.

2. Materials and Methods

2.1 Place and Management of Experiment

The experiment was conducted in farmer's field near major cotton growing area of Khargone (M.P.), India. The Experimental field was well drained medium black soil with medium availability of organic matter and potash. The PH and soluble salts were normal and experiment managed properly including, nutrition, irrigation, weed management and harvesting during study and applied 120:60:60 kg NPK/ha.

2.2 Sowing/Planting of Experiment

For both the objectives single cotton (*Gossypium hirsutum* L.) hybrid Brahma BG II grown in 300 sq meter (25mx12m) at spacing of 120x45 cm during *kharif* 2011 and *kharif* 2012 in isolated plot on 16th June and 11th June respectively.

2.3 Data Recording

The number of whitefly were recorded from (six quadrates 2.5mx2.5m and each quadrate five plants) three leaves (top, middle and bottom). The data was recorded at weekly interval after 20 DAS (days after sowing) till crop maturity. The first appearance of whitefly also recorded.

2.4 Weather Parameters

The weekly weather parameters, viz. maximum temperature, minimum temperature, morning humidity, evening humidity, rainfall and wind velocity were obtained from, Zonal Agriculture Research Station, Khargone, India

2.5 Data Analysis

Statistical analysis was carried out based on mean and simple correlation to find out possible relationship of whitefly population with various meteorological factors.

3. Results & Discussion

The first incidence of whitefly started with 0.13 and 0.5 whitefly/3leaves at 28th MSW during 2011 and 2012 respectively when crop was in two to four true leave stage (Table 1). The population reached its peak 16.78/3leaves in 43rd MSW during 2011 and 16.32 whiteflies/3 leaves in 40th MSW during 2012 when crop was in boll development stage and later population showed in decreasing trend and reached its minimum 0.23 and 2.3 whiteflies/3leaves at 52 MSW during first and second year respectively when crop was almost at maturity stage. The similar results were reported by other coworker when population of *B. tabaci* was maximum (2.10 to 3.64, nymphs/adult/leaves) at 150 days after sowing and was minimum at 60 and 90 DAS (0.15 to 0.30 nymphs/adult/leaves) [3]. The incidence of whitefly population was remained in the month of August in cotton while peak population of whitefly was recorded on August 10 and second peaks after 10 August [4]. The population of *B. tabaci* adults remained active through the cropping season [5]. The maximum number of whiteflies present at the vegetative stage and population increased as the season progressed [6].

The correlation studies of both the years (Table 2) revealed that maximum temperature (r=0.550) exhibited highly significant positive correlation with whitefly population during first year and non-significant positive correlation (r= 0.314) during second year of the experiment. Further highly significant negative correlation was noted with morning humidity (r= -0.581) during first year but not significant positive correlation noted during second year (r= 0.086). The significant negative correlation found with rainfall (r= - 0.575) during first year but non-significant negative correlation (r= -0.330) reported during second year. Wind velocity remain non-significant negative correlation (r= - 0.269 and r= -0.296) during both the years while evening humidity found non-significant positive correlation (r= 0.330 and r= 0.046) in both years with whitefly population. The present study is agreement with other coworker where maximum temperature was positively correlated with whitefly population [7]. Whitefly population showed significant positive correlation with maximum and minimum temperature [8]. Maximum and minimum temperatures were positively correlated while relative humidity was negatively correlated with whitefly on cowpea [9]. Whitefly population was positively correlated with temperature while negatively correlated with relative humidity [10].

4. Conclusions

The results of the present study revealed that the whitefly population was peak at 43 MSW and 40 MSW (October month) in 2011 and 2012 season respectively, when crop was in boll development stage and crop was full green and population slowly started decreasing with increase of plant maturity. The maximum temperature was significantly positively correlated with whitefly population while rainfall was negatively correlated with whitefly population.

Table 1: Population dynamics of whitefly during Kharif 2011 and 2012

DAS	MSW	Period	Whitefly/3 Leaves	
			Year 2011	**Year 2012**
20	27	2-8 July	0.00	0.00
27	28	9-15 July	0.13	0.50
34	29	16-22 July	0.37	1.25
41	30	23-29 July	0.26	0.00
48	31	30 July-5 Aug	0.43	1.14
55	32	6-12 Aug	0.57	0.45
62	33	13-19 Aug	2.00	4.81
69	34	20-26 Aug	1.10	6.51
76	35	27 Aug-2 Sept	0.89	2.45
83	36	3-9 Sept.	1.61	1.75
90	37	10-16 Sept	3.31	12.21
97	38	17-23 Sept	7.22	13.60
104	39	24-30 Sept	9.40	14.25
111	40	1-7 Oct	12.55	16.32
118	41	8-14 Oct	14.32	14.82
125	42	15-21 Oct	16.12	12.60
132	43	22-28 Oct	16.78	12.98
139	44	29 Oct-4 Nov	14.32	9.52
146	45	5-11Nov	13.59	7.96
153	46	12-18 Nov	15.44	1.34
160	47	19-25 Nov	6.69	2.09
167	48	26 Nov-2 Dec	5.23	2.34
174	49	3-9 Dec	2.51	1.57
181	50	11-16 Dec	1.54	1.50
188	51	17-23 Dec	1.78	2.65
195	52	24-31 Dec	0.23	2.30

DAS (Days After Sowing), MSW (Metrological Standard Week)

Table 2: Correlation coefficient between whitefly and abiotic factors

S. No.	Weather parameters	Year 2011	Year 2012
1	Maximum Temperature (^{0}c)	0.550**	0.314
2	Minimum Temperature (^{0}c)	-0.276	0.052
3	Morning Humidity (%)	-0.581**	0.086
4	Evening Humidity (%)	0.330	0.046
5	Rainfall (mm)	-0.575*	-0.330
6	Wind velocity (km/h)	-0.269	-0.296

*Significant at 5% level, ** Significant at 1% level

5. Acknowledgement

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6. References

1. Anonymous. Management of Whitefly, *Bemisia tabaci* G. on Cotton. Andhra Predesh Agriculture University Rajendranagar, Hyderabad, India, 1989, 50.
2. Butani DK, Jotwani MG. Insects in vegetables. Periodical Export Book Agency, Delhi, India, 1984, 68.
3. Fakhri SAM, Jamal K. Population dynamics of major insect pests of cotton in relation to abiotic factors. International Journal of Advanced Biological Research. 2012; 2(3):500-505.
4. Shahid MR, Farooq J, Mahmood A, Ilahi F, Ria M, Shakeel A, *et al.* Seasonal occurrence of sucking insect pest in cotton ecosystem of Punjab, Pakistan. Advances in Agriculture & Botanics. 2012; 4(1):26-30.
5. Shera PS, Kumar V, Aneja A. Seasonal Abundance of sucking insect pests on transgenic Bt cotton vis-à-vis weather parameters in Punjab, India. Acta Phytopathologica et Entomologica Hungarica. 2013; 48(1):63-74.
6. Bishnoi OP, Singh M, Rao VUM, Ram Niwas, Sharma PD. Population dynamics of cotton pests in relation to weather parameters. Indian Journal of Entomology. 1996; 58(2):103-10.
7. Shivanna BK, Nagaraja DN, Manjunatha M, Naik MI. Seasonal incidence of sucking pests on transgenic Bt cotton and correlation with weather factors. Karnataka Journal of Agricultural Sciences. 2009; 22(3):666-667.
8. Selvaraj S, Ramesh V. Seasonal abundance of whitefly, *Bemisia tabaci* Gaennadius and their relation to weather parameters in cotton. International Journal of Food, Agriculture and Veterinary Sciences. 2012; 2(3)-57-63.
9. Singh AK, Kumar S, Pandey V. Effect of meteorological parameters on the population build-up of sap feeders on cowpea. Shashpa. 2002; 9(2):149-152.
10. Ashfaq M, Ane MNU, Zia K, Nasreen A, Hasan MU. The correlation of abiotic factors and physico-morphic charateristics of (*Bacillus thuringiensis*) *Bt* transgenic cotton with whitefly, *Bemisia tabaci* Homoptera: Aleyrodidae and jassid, *Amrasca devastans* Homoptera:

Jassidae populations. African Journal of Agricultural Research. 2010; 5(22):3102-3107.