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Population dynamics of different pests on Bt-cotton vis –a –vis meteorological parameters in Punjab

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ABSTARCT

The incidence of Jassid, whitefly and tobacco caterpillar was recorded from the South-Western districts of Punjab i.e. Muktsar, Faridkot and Ferozepur during cotton season in 2007. Correlation coefficients were calculated between number of whitefly, jassid, tobacco caterpillar and meteorological parameters. The incidence of jassid and tobacco caterpillar was low as compared to whitefly in all the districts. All the meteorological factors contribute in determining the incidence of different pests, but rainfall has definitely negative impact on the jassid and whitefly population.

Key words: Bt-cotton, pests population, weather parameters.

Cotton, being the most important commercial crop, plays a vital role in social and economy of India. However, the cotton productivity in the country with 502 kg lint ha^{-1} is far less than other cotton growing countries, viz. Brazil (1298 kg ha^{-1}), China (1245 kg ha^{-1}), USA (918 kg ha^{-1}), Uzbekistan (770 kg ha^{-1}) and Pakistan (686 kg ha^{-1}) (AICCIP, 2007). Besides other causes, the foremost reason for the low productivity is the attack of insect pests, which play a significant role in its cultivation for achieving optimum yield potential. About 162 insect species are associated with cotton crop in India, of which nine are of utmost important in Punjab causing significant losses in yield (Dhawan *et al.,* 2004). The development of transgenic cotton has resulted in an immensely increase in the seed-cotton yield and reduction in the insecticidal sprays from 3.10 to 1.17 (Barwale *et al.,* 2004). It helped the farmers to manage the population of bollworm and *H. armigera,* the most important pest causing about 31.0 per cent maximum loss in non-transgenic cotton (Grower and Pental, 2003) and avoid more than 80 per cent potential crop losses in cotton (Oerke *et al.,* 2005), contributing to higher yields. This technology has also resulted in serious outbreaks of insect-pests in agricultural crops such as *Spodoptera litura* Fab. on Bollgard I only and sucking pests like whitefly, jassid and thrips etc. There is considerable increase in incidence of whitefly, jassid and tobacco caterpillar since the introduction of Bt-cotton in state. Keeping this in view, the present study was planned to evaluate the severity of insect-pest in the fields of south-western districts of Punjab i.e. Muktsar, Faridkot and Ferozepur in relation to the weather parameters.

MATERIALS AND METHODS

The incidence of Jassid, whitefly and tobacco caterpillar was recorded from the south-western districts of Punjab i.e. Muktsar, Faridkot and Ferozepur. The infested fields were selected from 190 villages selected under Insect-Pest Resistance Management Project in all districts and mean number of whitefly, jassid and tobacco caterpillar was worked out for the every meteorological week (From 30th to 38th week). The number of whitefly and jassid were counted from three fully opened leaves from top and tobacco caterpillar count was taken from whole of cotton plant. A daily observation of different meteorological parmeters was recorded in Agrometeorological observatory situated at RRS, Bathinda (Fig. 3). Correlation coefficients were calculated between number of whitefly, jassid, tobacco caterpillar attacking and meteorological parameters. Step wise regression analysis was conducted between pests and meteorological parameters.

RESULTS AND DISCUSSION

Incidence of jassid, whitefly and tobacco caterpillar

Very low incidence of jassid and tobacco caterpillars was found from 30th to 38th meteorological week in all the districts. The average numbers of jassid and tobacco caterpillar were found as 0.9 and 0.4 (Muktsar), 1.1 and 0.5 (Ferozepur) and 1.8 and 0.8 (Faridkot), respectively. No generalized trend was observed for the incidence of jassid with the meteorological week. However, the incidence of tobacco caterpillar was found to increase from 30th to 38th meteorological week in all the districts. The incidence of whitefly tended to increase from the 30th to 35th meteorological week in all the districts. The highest number of whitefly (7.3, 1.9 and 2.9) was found in 35th meteorological week in Muktsar, Ferozepur and Faridkot districts, respectively. After this, a decline in the population dynamics

Table 1 : Population dynamics of different pests on Bt-cotton in different districts of Punjab during 2007

SMW	Muktsar			Ferozepur			Faridkot		
	Jassid	Whitefly	Tobbaco caterpillar	Jassid	Whitefly	Tobbaco caterpillar	Jassid	Whitefly	Tobbaco caterpillar
30th	0.5	1.0	0.0	0.5	0.5	0.0	0.7	0.7	0.0
31st	0.3	1.1	0.0	2.1	2.3	0.0	1.0	0.7	0.3
32nd	0.2	0.6	0.4	0.5	0.5	0.0	0.8	0.6	0.3
33rd	1.1	3.5	0.4	1.1	1.2	0.2	2.3	1.6	0.8
34th	1.7	4.2	0.4	1.3	1.5	0.2	2.2	1.6	0.9
35th	1.0	7.3	0.4	1.5	1.9	0.5	2.8	2.9	0.9
36th	1.0	6.9	0.7	1.2	1.6	1.1	2.3	2.6	1.3
37th	1.2	4.5	0.7	0.3	0.5	1.5	2.1	2.5	1.2
38th	0.8	5.0	0.6	1.1	1.5	1.2	2.1	2.4	1.1
Average	0.9	3.8	0.4	1.1	1.3	0.5	1.8	1.7	0.8

Table 2 : Correlation coefficients between different pests and meteorological parameters in different districts of Punjab on cotton during 2007

Districts	Tmax	Tmin	Tmean	RHm	RHe	RHmean
			Jassid			
Muktsar	0.13	-0.30	-0.16	-0.53	-0.77	-0.80
Ferozepur	0.46	0.30	0.35	-0.13	-0.13	-0.16
Faridkot	-0.04	-0.42	-0.31	-0.31	-0.58	-0.55
			Whitefly			
Muktsar	-0.07	-0.50	-0.37	-0.09	-0.59	-0.43
Ferozepur	0.36	0.13	0.20	-0.07	-0.21	-0.17
Faridkot	-0.27	-0.67	-0.56	0.03	-0.55	-0.33
			Tobbaco caterpillar			
Muktsar	-0.64	-0.79	-0.78	0.21	-0.38	-0.11
Ferozepur	-0.63	-0.94	-0.88	0.38	-0.62	-0.15
Faridkot	-0.37	-0.74	-0.65	0.02	-0.68	-0.42

of whitefly was found.

Correlation coefficients

Correlation coefficient was calculated between field infestation by jassid, whitefly and tobacco caterpillar and major meteorological parameters (Table 2).

Population dynamics of the tobacco caterpillar was negatively correlated with maximum, minimum and mean temperature in all the districts. Similar trend was found with the population dynamics of whitefly except in the Ferozepur district where some positive correlation was found with the maximum, minimum and mean temperature. Population dynamics of the jassid also found a similar trend as found in whitefly where again some positive correlation was found in Ferozepur districts with the maximum, minimum and mean temperature. Population dynamics of jassid, and whitefly was negatively correlated with the morning relative humidity, evening relative humidity and mean relative humidity in all the districts. Similar types of result were found by Dhawan *et al.,* 2007 where field infestation of mealy bug was negatively correlated with morning relative humidity, evening relative humidity and mean relative humidity in most of the districts studied. The population dynamics of tobacco caterpillar was positively correlated with the morning relative humidity while it was negatively correlated with the evening relative humidity and mean relative humidity. Rainfall definitely had a negative impact on the population dynamics of jassid and whitefly where a negative correlation was found in all the districts while a positive correlation was found with population dynamics of tobacco caterpillar in all the districts. The result collaborated with the findings of Dhawan et al., 2007 where rainfall was negatively correlated with the field infestation of mealy bug in Mansa, Bathinda, Muktsar, Faridkot and Ferozepur.

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