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Seasonal incidence of major insect pests and their correlation with weather parameters in cotton

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Abstract
Cotton is one of the important cash crop of farmers community in India and its production affected by insect pest. In order to determine the seasonal incidence of major insect pest of cotton and its correlation with weather parameters these studies carried out was department of Agricultural Entomology, VNMKV, Parbhani. The incidence of aphids was highest (20.4 aphids/three leaves) during 40th MW. Jassid highest population (21.6 jassids/three leaves) was observed during 37th MW. Thrips reached highest incidence (30.20 thrips/three leaves) in 41rd MW. Highest incidence or population of whitefly (24.50 whiteflies/three leaves) was noticed during 37nd MW. The larval population of *Helicoverpa armigera* was highest (5.40 larvae/plant) in 43th MW. Percent rosette flowers due to *P. gossypiella* was highest (27.17%) in 41th MW. Larval population of *P. gossypiella* was highest (25 larvae/ 20 green boll) in 48th MW and per cent green boll infestation due to *P. gossypiella* is highest (125%) in 48th MW. Simple correlation studies revealed that weather parameters *viz.*, Aphid population was negatively significant with the rainfall and maximum temperature. The Jassid population was negatively significant with the maximum temperature. Thrips population was negatively significant with the rainfall, maximum temperature, morning relative humidity as well as wind velocity.
Whitefly population with weather parameters in cotton showed that negatively significant with the rainfall and maximum temperature. The *H. armigera* population was negatively non-significant with the rainfall, evening RH, and wind velocity. The data on rosette flowers by *P. gossypiella* showed that positively non-significant with rainfall, minimum temperature, bright sun shine, and wind velocity.

Keywords: Cotton, pink bollworm, aphid, jassid, thrips, whitefly, correlation, population dynamics

Introduction
Cotton is a major fiber crop of global significance, cultivated in more than seventy countries in the world. Major Cotton producing countries are China, India, USA and Pakistan accounts for approximately three-quarters of world cotton production. The area under cotton production in the world is estimated at around 34.14 million hectares and production is 121.37 million bales of 480 lb [1].
Cotton occupies a vital role in the agrarian economy of India. It provides raw material to the domestic textile and the other subsidiary industries employees millions of hands and earns substantial amount of foreign exchange. Cotton plant with its green leaves, many large open flowers, nectarines on every leaf and flowers and large number of fruits seems to specially attract the insect pests under natural condition. Different types of insects with chewing and sucking habits attack the crop causing serious damage, which can result in partial or total failure of the crop. They do not only lower the yield but also impair the quality of the fiber. Among the insect pests of cotton, the important sucking pests are *viz*; aphid, *Aphis gossypii* (Glover), jassid, *Amrasca biguttula biguttula* (Ishida), thrips, *Thrips tabaci* (Linnman) and whitefly *Bemisia tabaci* (Gennadius) are regular occurrence and cause considerable damage. In order to develop effective management strategies for these pests, it is imperative to study their seasonal incidence and population fluctuations during the crop season.
The pink bollworm, *Pectinophora gossypiella* (Saunders), was described by W.W. Saunders in 1843 as *Depressaria gossypiella* from specimens found to damaging cotton in India. At present, the pink bollworm has been recorded in nearly all cotton-growing countries of the world and is a key pest in many of these areas. In recent years, severe damage to bolls by pink bollworm and yield-losses were observed in *Bt*-cotton in many regions of Gujarat and some parts of AP, Telangana and Maharashtra [4].

Maharashtra is also having more than 90% area under *Bt* cotton genotypes. Since

Materials and methods

The experiment was conducted in unprotected plot which was non-replicated and the plot size was 9 × 9 m which was divided in four quadrants. NH-615 (non-*Bt*) variety was used for experiment with spacing 60 × 30 cm. Population of aphids, jassids, thrips and whiteflies were recorded at weekly interval from three leaves (each from top, middle and bottom canopy) on five randomly selected plants from each quadrant. Larval population of *H. armigera* were recorded on randomly selected five plants from net plot on whole plant basis and the average population per plant was worked out. *Infestation of H. armigera in fruiting bodies*: Total number of green fruiting bodies (buds, flowers, squares and bolls) on the plant were counted and damaged due to bollworms were recorded by observing entry holes on the squares and bolls. The percentage damage in green fruiting bodies was worked out by using following formula:

$$\% \text{ damage in green fruiting bodies} = \frac{\text{Damaged green fruiting bodies}}{\text{Total green fruiting bodies}} \text{ X } 100$$

$$\% \text{ Shed material} = \frac{\text{Shed material after insecticide treatment due to bollworms}}{\text{Total shed material (PTC)}} \text{ X } 100$$

Rosette flower due to *P. gossypiella*: Total number of flowers and damaged flowers by pink bollworm collected at weekly interval from the randomly selected plants from each quadrant were counted. From this per cent rosette flowers damaged due to pink bollworm was worked out:

$$\text{Per cent rosette flowers} = \frac{\text{Damaged flowers}}{\text{Total number of flowers}} \text{ X100}$$

Infestation of *P. gossypiella* in green bolls: Incidence of pink bollworm was recorded by splitting twenty green bolls from the border line plants of each plot (75, 90, 105, 120, 135 and 150 days). These bolls were dissected out and observed for the presence of pink bollworm larvae and its infestation. Number of pink bollworm larvae per boll was counted and per cent infestation of pink bollworm in green bolls was calculated.

Relationship between weather parameters and insect pests of cotton: The data pertaining to seasonal incidence of major insect pests was compared with various weather factors. The relation between weather parameters and major insect pests in cotton was studied. Simple correlation was calculated.

Results and discussion

The data on seasonal incidence of major insect pests infesting cotton in relation to weather parameters is presented in tables 1 and 2.

The data on population of aphid in cotton during *Kharif* 2018 ranged between 3.0 to 20.4 /three leaves. The incidence of aphid population per three leaves started from 29th SMW (3.1) with its first peak (11.2) and second peak (14.2) observed in 36th SMW. The highest incidence was recorded in 40th SMW (20.4 aphids/ three leaves). The trend of aphid infestation was more or less similar to those reported by earlier research workers like Patel and Rote (1995) [6] who observed 43.05 aphids / 3 leaves in the second fortnight of October. The population fluctuations of jassid per three leaves in cotton during *Kharif* 2018 ranged between 2.0 to 21.6. The incidence of jassid population per three leaves started from 29th SMW (3.9) with its first peak in 31th SMW (10.2) and second peak in 37th SMW (21.60). The present findings are in confirmation with the earlier researchers like Patel (1992) [6] observed the peak infestation of jassids from 4th week of September to 4th week of November on *desi* cotton. Mohapatra (2008) [5] reported the leaf hopper infest cotton crop from 30thstandard week to 50thstandard week with peak population during 41st standard week (October 8-14). Prasad *et al.* (2008) [8] also observed the peak incidence of leafhopper on cotton from 37th to 47th standard week (mid September to November).

The data on population dynamics of thrips per three leaves in cotton during *Kharif* 2018 ranged between 2.8 to 30.20. The incidence of thrips population per three leaves started from 29th SMW (3.30) with its first peak in 31th SMW (12.5) and second peak in 41th SMW (30.20). Patel (1992) [7] who reported that the population of thrips first appeared in 34th standard week to 40th standard week with highest population was observed in 37th standard week (2nd week of September). The population fluctuations of whitefly per three leaves in cotton during *Kharif* 2018 ranged between 3.8 to 24.50 and incidence started from 29th SMW (3.60) with its first peak in 37th SMW (24.50). Purohit *et al.* (2006) [9] studied the seasonal incidence of major insect pests of cotton at R.C.A. Udaipur during *Kharif* 2003-04 and 2004-05. The incidence of whitefly *(B. tabaci)* started in the first fortnight of July during both the years. The whitefly attained its peaks in 2nd week of August and 3rdweek of September during respective years. The population of *H. armigera* larvae per plant during *Kharif* 2018 in cotton ranged between 0.62 to 5.40 larvae/plant and incidence started from 35th SMW (0.62) with its first peak in 43th SMW (5.40). Daware *et al.* (1994) [2] who reported the incidence of *H. armigera* in 33rd SMW and it was peak in the month of September and October (35th to 41st SMW). The data on infestation of fruiting bodies due to larval population in cotton ranged between 5.21 to 34.60 per cent and infestation started from 35th SMW (5.21 per cent) with its first peak in 40th SMW (34.60 per cent) and second peak in 46th SMW (10.25 per cent). The rosette flowers due to pink bollworm in cotton ranged from 2.00 to 27.17 per cent occurring from 36th SMW. The peak activity of rosette flowers was noticed from 38th to 43th SMW (highest 27.17 per cent in 41th SMW). The larval population of *P. gossypiella* in cotton ranged between 2.00 to 25.00 larvae/ 20 bolls. The incidence in 39th SMW was 2.00 larvae / 20 bolls with 10.00 per cent green boll damage. The peak incidence was noticed in 48th SMW i.e. 25 larva/20 bolls with 125 per cent green boll damage. Purohit *et al.* (2006) [9] recorded the maximum square damage during 3rd and 2nd week of October, while the maximum boll damage was recorded in the 2nd and 1st week of October during 2003 and 2004, respectively.

Table 1: Population dynamics of major insect pests and natural enemies in cotton

MW	Duration	Population / 3 leaves					*H. armigera larvae*/plant	Fruiting body Damage %	Rosette Flower	Green boll damage P. gossypiella
		Aphids	Jassids	Thrips	Whiteflies	LBB				
27	02-08 July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	09-15 July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	16-22 July	3.1	3.9	3.3	3.6	0.00	0.00	0.00	0.00	0.00
30	23-29 July	7.8	6.4	7.9	6.1	0.40	0.00	0.00	0.00	0.00
31	30-05 Aug	11.2	10.2	12.5	10.8	0.60	0.00	0.00	0.00	0.00
32	06-12 Aug	7.4	6.6	9.1	8.3	0.80	0.00	0.00	0.00	0.00
33	13-19 Aug	4.1	4.2	4.2	3.8	0.40	0.00	0.00	0.00	0.00
34	20-26 Aug	4.3	5.1	4.1	4.0	0.40	0.00	0.00	0.00	0.00
35	27-02 Sept	9.4	10.3	10.2	14.3	0.60	0.62	5.21	0.00	0.00
36	03-09 Sept	14.2	15.0	8.2	21.5	0.80	0.90	11.04	2.00	0.00
37	10-16 Sept	16.4	21.6	16.3	24.5	1.2	1.22	16.80	6.29	0.00
38	17-23 Sept	17.8	16.6	18.3	20.2	0.80	1.07	24.10	11.13	0.00
39	24-30 Sept	18.0	14.3	23.2	16.3	0.60	1.90	30.92	15.27	10.00
40	01-07 Oct	20.4	16.4	27.3	18.4	0.40	2.10	34.60	25.21	15.00
41	08-14 Oct	17.9	15.2	30.2	17.8	0.60	2.60	29.10	27.17	25.00
42	15-21 Oct	15.2	14.1	26.8	16.5	0.60	4.50	27.00	22.50	45.00
43	22-28 Oct	13.2	12.3	20.3	14.2	0.40	5.40	15.38	15.30	50.00
44	29-04 Nov	12.8	11.0	15.4	11.3	0.40	4.10	12.50	7.80	65.00
45	05-11 Nov	10.6	10.3	13.9	9.8	0.00	3.20	7.08	3.21	75.00
46	12-18 NOV	8.8	9.8	11.6	9.2	0.00	2.00	10.25	2.14	95.00
47	19-25 Nov	8.2	7.9	9.3	8.9	0.00	1.20	6.84	2.00	110.00
48	26-02 Dec	5.1	4.2	6.1	5.6	0.00	0.00	0.00	0.00	125.00
49	03-09 Dec	4.2	3.6	5.3	4.4	0.00	0.00	0.00	0.00	100.00
50	10-16 Dec	3.0	2.0	2.8	3.8	0.00	0.00	0.00	0.00	90.00
51	17-23 Dec	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	65.00
52	24-31 Dec	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	20.00

Table 2: Correlation of weather parameters with insect pests and natural enemies in cotton during 2018-19

Weather parameters	Correlation coefficient ('r' value)							
	Aphid	Jassid	Thrips	Whitefly	Lady bird Beetle	*H. armigera*	Fruiting Body Damage	Rosette flower *P. gossypiella* (%)
Rainfall	-0.404*	-0.360	-0.390*	-0.400*	-0.126	-0.233	-0.229	0.064
Temp. max (^{0}C)	-0.574*	-0.508*	-0.660*	-0.493*	-0.046	-0.733*	-0.670*	-0.812*
Temp. min (^{0}C)	0.243	0.267	0.121	0.264	0.513*	0.156	0.529*	0.420
Morning RH (%)	-0.304	-0.229	-0.432*	-0.209	0.172	-0.479*	-0.028	-0.134
Evening RH (%)	0.042	0.085	-0.133	0.107	0.477*	-0.337	0.002	-0.153
Bright Sun shine (hrs)	0.387	0.357	0.441*	0.350	-0.034	0.423	0.136	0.216
Wind velocity (km/hr)	-0.343	-0.343	-0.418*	-0.307	0.150	-0.283	-0.188	0.034
	n 26					n 19		n 15

*Significant at 5%.

Simple correlation and regression between weather parameters and major insect pests in cotton: Simple correlation studies between weather parameters and mean population of sucking pests in cotton revealed that weather parameters *viz.*, Aphid population was negatively significant with the rainfall (r= -0.404) and maximum temperature (r =-0.574). The aphid population was positively non-significant effect with minimum temperature (r = 0.243), evening RH (0.042) and bright sun shine (0.387). Aphid population was negatively non-significant with morning relative humidity (r = -0.304) as well as wind velocity (-0.343). Rathod and Bapodra (2004) [10] who reported that the maximum temperature had positive correlation, whereas minimum relative humidity showed the negative correlation with the aphid population in cotton. The jassid population was negatively significant with the maximum temperature (r = -0.508). The jassid population was positively non-significant effect with minimum temperature (r = 0.267), evening RH (0.085) and bright sun shine (0.357). jassid population was negatively non-significant with rainfall (r = -0.360), morning relative humidity (r = -0.229) as well as wind velocity (-0.343).

Purohit *et al.* (2006) [9] observed showed positive correlation of all abiotic factors with jassid population. whitefly population with weather parameters in cotton showed that negatively significant with the rainfall (r= -0.400) and maximum temperature (r = -0.493). The whitefly population was positively non-significant effect with minimum temperature (r = 0.264), evening RH (0.107) and bright sun shine (0.350). whitefly population was negatively non-significant with morning relative humidity (r = 0.209) as well as wind velocity (-0.307). Sekhen *et al.* (1994) [11] who observed that the incidence of whiteflies on cotton starts from end of June and it increases considerably in dry season while the rains above 40 cm affected the population adversely. The *H. armigera* population was negatively non-significant with the rainfall (r = -0.233), evening RH (r = -0.337), and wind velocity (r=-0.283). The *H. armigera* population showed negatively significant effect with maximum temperature (r = -0.733) and morning RH (r =- 0.479). *H. armigera* population was positively non-significant with minimum temperature (r = 0.156) and bright sun shine (0.423). Dhawan *et al.* (1996) [3] observed negative and non-significant correlation between the catches of American bollworm in pheromone trap with rainfall. The data on rosette flowers by *P. gossypiella* showed

that positively non-significant with rainfall, minimum temperature, bright sun shine, and wind velocity. and negatively significant with maximum temperature. and negatively non-significant correlation with morning RH and evening RH.

Conclusions

The studies on population dynamics of major pests in cotton clearly indicated that bollworms were the predominant pests than sucking pests *viz.*, aphids, jassids, thrips and whiteflies on cotton as their incidence recorded throughout the season *kharif 2018*. On the basis of population dynamics of larval population, fruiting bodies damage, rosette flowers due to pink bollworm and boll damage during *Kharif* 2018 due to variation in weather parameters. The predators were present throughout the cropping period when there was more incidence of larval population as well as sucking pests.

The correlation studies indicated that the correlation exist between pest population with different weather parameters. Also there was a combined effect of weather parameters on pest population and their incidence on cotton. It showed per cent variation in pest population and their incidence along with their direct and indirect effects. Mostly, the correlation between larval population *viz.*, *E. vittella*, *H. armigera* and with weather parameters obtained was positive and definite as the incidence of bollworms on cotton was due to the variation in weather parameters like temperature, rainfall and humidity. However, there were no confirmed reports as to how the abiotic factors like temperature, rainfall and humidity influence the abundance of the pink bollworm populations on cotton. The population of *E. Vittela* very negligible.

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References

1. Anonymous. Annual report of cotton corporation of India, 2018.
2. Daware DG, Suryanwanshi AP, Changule RB, Patil MS. Incidence of cotton bollworms in relation to meteorological factors in Marathwada region (M.S.). J Cotton Res. Dev. 1994; **8**(1):72-80.
3. Dhawan AK, Simwat AS, Sidhu AS. Effect of sowing dates on incidence of sucking pests and bollworms in arborium cotton. J. Res. P.A.U. 1996; 24(1):75-85.
4. Kranti KR, Naidu S, Dhawad CS, Mate TK, Patil E, Bharose AA *et al*. Temporal and intraplant variability of cry 1 Ac expression in Bt cotton and its influence on the survival of the cotton bollworm, Heliocoverpa armigera Hubner (Noctuidae lepidoptera). 2005; 89(2):291-298.
5. Mohapatra LN. Population dynamics of sucking pests in hirsutum cotton and influence of weather parameters on its incidence in western Orissa. J Cotton Res. Dev. 2008; 22(2):192-194.
6. Patel IS, Rote NB. Seasonal incidence of sucking pest complex of cotton under rainfed conditions of South Gujarat. GAU. Res. J. 1995; 1:127-129.
7. Patel JR. Integrated Pest Management in Cotton Hybrid-6. Ph.D. Thesis submitted to GAU, Anand, 1992.
8. Prasad NVVSD, Rao NHP, Mahalakshmi MS. Population dynamics of major sucking pests infesting cotton and their relation to weather parameters. J. Cotton Res. Dev. 2008; 22(1):85-9.
9. Purohit D, Ameta DP, Sarangdevot SS. Seasonal incidence of major insect pests of cotton and their natural enemies. Pestology. 2006; 30(12):24-29.
10. Rathod RR, Bapodra JG. Population Dynamic of Aphid, (A. Gossypii) on cotton. Agriculture Science. Digest. 2004; 24(1):48-50.
11. Sekhen BS, Singh J, Sambyal JS. Population dynamics of whitefly on different varieties of cotton. National Symposium on Emerging trends in Pest Management, 1994, 8-9.