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SEASONAL INCIDENCE OF MAJOR SUCKING PESTS AND PREDATORS ON COTTON (GOSSYPIUM SPP)

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Abstract:

In order to understand the seasonal occurrence and activity of insect pest on cotton, studies were carried out at Agricultural Research Sub-Centre, Achalpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif*, 2016. Seasonal incidence of sucking pests viz. leaf hopper, thrips and aphid, and white fly *and* bioagents like LBB and spider was observed. Aphid was observed throughout growing season up to 49th MW. It has attained its initial peak during 35th MW (0.7/ leaf) which was favored by min. temp. of 31.66 ^{o}C and max. temp. of 33.20 ^{o}C with morning 96.86 % and evening 81.71 % humidity along with 4.00 mm rainfall. Leaf hopper reached its peak during 48th MW (0.4/ leaf) which was favored by min. temp. of 28.59 ^{o}C and max. temp. of 33.76 ^{o}C with morning 78.00 % and evening 33.43 % humidity along with no rainfall. Incidence of thrips was initiated in 34th MW (0.1/ leaf) and continued up to 49th MW with disappearance in 46th MW. Incidence of whitefly was first observed in 34th MW (0.5/ leaf) and continued slowly increase and decrease steadily up to 49th MW with disappearance in 36th and 37th MW. It was at its peak during 44th MW (1.9 Nymph/leaf). The meteorological parameters were in range of min. temp. of 30.41 ^{o}C and max. temp. of 34.29 ^{o}C with morning 80.86 % and evening 41.29 % humidity along with no rainfall during 44th MW. Predator activity was observed throughout the season form 33rd MW to 49th MW with disappearance in 38th and 45th to 46th MW.

Key Words: Seasonal Incidence, Cotton, Sucking Pests & Predator

Introduction:

Cotton occupies a unique position in Indian agricultural economy. American and desi cotton are cultivated in India. American cotton (*Gossypium hirsutum*) is more vulnerable to the attack of sucking insect pest complex than desi cotton (*Gossypium arborium*) (Nath *et al* 2000). It is attacked by 145 dissimilar species of insect and mite pests. Jassid, whitefly, thrips and leaf hoppers are major complication for escalating yield and productivity of the crop. The occurrence and progress of all the insect pests are much dependent upon the customary environmental factors such as temperature, relative humidity and precipitation. The activities of these insect pests are fluctuated under erratic environmental conditions. For instance, jassid and whitefly exhibit their activity under wet environmental conditions whereas thrips and mites under high temperature dry situations (Khan & Ullah 1994). Keeping in view the present studies were carried out to investigate the seasonal incidence and peak activity of sucking insect pest and bioagents of cotton throughout cotton growing season in order to manage insect pest prior to their economic injury.

Material and Methods:

The present study was carried out at Agricultural Research Sub-Centre, Achalpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif*, 2016 in order to determine the seasonal occurrence of sucking insect pest and their bioagents on cotton. The crop was sown on 4th July 2016 and the seeds used for the experiment were devoid of any insecticide treatments for early sucking pest control. The plot size was 10 x 10 m with 60 x 15 cm spacing. All the recommended agronomical practices were followed to raise the crop successfully as per package of practices prescribed for the region. Weekly observation was recorded on 10 randomly selected plants. Aphids, leaf hoppers, thrips, whitefly and mite population count was recorded on top, middle and bottom canopy of each plant. Dropping shoots/ drying top shoots due to top shoot borer were also recorded on 10 randomly selected plants. Average No. of aphids, leaf hoppers, thrips and whitefly were calculated per leaf per plant. Number of predators like lady bird beetle and spider were also recorded per plant.

Results and Discussion:

The experimental results of the investigations carried out on seasonal incidence of sucking pests of cotton and their natural enemies is presented in tables. Incidence of aphids was initiated in 33rd MW (0.5/ leaf) and aphid population was decrease and increased with subsequent MW up to 49th MW and was lowest in 40th & 41st MW (0.1/ leaf). However it was observed throughout growing season up to 49th MW. It has attained its initial peak during 35th MW (0.7/ leaf) which was favored by min. temp. of 31.66 ^{o}C and max. temp. of 33.20 ^{o}C with morning 96.86 % and evening 81.71 % humidity along with 4.00 mm rainfall. Highest peak during 45th

MW (3.4/ leaf) which was favored by min. temp. of 29.83 ^{o}C and max. temp. of 33.89 ^{o}C with morning 82.14 % and evening 40.71 % humidity along with no rainfall.

Table 1: Incidence of Aphid on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of Aphid	Weather parameters				
				Temp Min	Temp Max	R.H (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.5	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.2	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.7	31.66	33.20	96.86	81.71	4.00
8	36	06.09.16	0.7	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.2	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.5	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.2	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.1	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.1	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.0	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	2.6	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	1.0	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	3.4	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.5	29.14	33.96	74.14	28.43	0.00
19	47	21.11.16	0.3	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	1.1	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.6	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R Values				**-0.3143**	**0.4385***	**-0.4638***	**-0.4817***	**-0.3476**

*Significant at 0.05% level (Table value-0.413)

** Highly significant at 0.01% level (Table value-0.526)

Incidence of leaf hoppers was initiated in 34th MW (0.1/ leaf) and thereafter continued up to 48th MW with disappearance in 39th, 40th, 41st and 42nd MW. It reached its peak during 48th MW (0.4/ leaf) which was favored by min. temp. of 28.59 ^{o}C and max. temp. of 33.76 ^{o}C with morning 78.00 % and evening 33.43 % humidity along with no rainfall and followed by 43rd MW (0.3/ leaf) which was favored by min. temp. of 30.26 ^{o}C and max. temp. of 34.67 ^{o}C with morning 85.14 % and evening 41.86 % humidity along with no rainfall.

Table 2: Incidence of leaf hopper on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of Leaf Hopper	Weather parameters				
				Temp Min	Temp Max	R.H. (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.0	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.1	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.2	31.66	33.20	96.86	81.71	4.00
8	36	06.09.16	0.2	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.1	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.1	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.0	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.0	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.0	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.0	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	0.3	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	0.2	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	0.2	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.0	29.14	33.96	74.14	28.43	0.00

19	47	21.11.16	0.1	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	0.4	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.0	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R values				**-0.2719**	**0.3696**	**-0.4254***	**-0.4124**	**-0.4003**

*Significant at 0.05% level (Table value-0.413)
** Highly significant at 0.01% level (Table value-0.526)

Incidence of thrips was initiated in 34th MW (0.1/ leaf) and continued up to 49th MW with disappearance in 46th MW. It was at its peak during 43rd MW (0.6/leaf) which was favored by min. temp. of 30.26 °C and max. temp. of 34.67 °C with morning 85.14 % and evening 41.86 % humidity along with no rainfall followed by in 48th MW (0.3/leaf) which was favored by min. temp. of 28.59 °C and max. temp. of 33.76 °C with morning 78.00 % and evening 33.43 % humidity along with no rainfall.

Table 3: Incidence of thrips on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of Thrips	Weather parameters				
				Temp Min	Temp Max	R.H (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.0	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.1	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.1	31.66	33.20	96.86	81.71	4.00
8	36	06.09.16	0.1	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.1	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.1	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.2	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.1	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.1	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.1	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	0.6	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	0.2	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	0.2	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.0	29.14	33.96	74.14	28.43	0.00
19	47	21.11.16	0.1	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	0.3	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.3	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R values				**-0.2997**	**0.6686****	**-0.4206***	**-0.4825***	**-0.3655**

*Significant at 0.05% level (Table value-0.413)
** Highly significant at 0.01% level (Table value-0.526)

Incidence of whitefly was first observed in 34th MW (0.5/ leaf) and continued slowly increase and decrease steadily up to 49th MW with disappearance in 36th and 37th MW. It was at its peak during 44th MW (1.9 Nymph/leaf). The meteorological parameters were in range of min. temp. of 30.41 °C and max. temp. of 34.29 °C with morning 80.86 % and evening 41.29 % humidity along with no rainfall during 44th MW. Second peak in 43rd MW (1.4/leaf) which was favored by min. temp. of 30.26 °C and max. temp. of 34.67 °C with morning 85.14 % and evening 41.86 % humidity along with no rainfall.

Table 4: Incidence of white fly on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of White Fly	Weather parameters				
				Temp Min	Temp Max	R.H (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.0	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.5	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.5	31.66	33.20	96.86	81.71	4.00

8	36	06.09.16	0.0	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.0	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.3	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.4	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.3	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.7	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.7	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	1.4	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	1.9	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	0.5	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.9	29.14	33.96	74.14	28.43	0.00
19	47	21.11.16	1.0	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	0.5	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.5	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R Values				**-0.3437**	**0.5707****	**-0.6031****	**-0.5833****	**-0.4102**

*Significant at 0.05% level (Table value-0.413)
** Highly significant at 0.01% level (Table value-0.526)

Predator activity was observed throughout the season form 33rd MW to 49th MW with disappearance in 38th and 45th to 46th MW. Low population of lady bird beetle (0.1 to 0.2/ Plant) was recorded. It was at its peak during 36th MW (0.2/ plant) with meteorological parameters in the range of min. temp. of 32.04 °C and max. temp. of 33.81 °C with morning 98.29 % and evening 81.14 % humidity along with 15.30 mm rainfall. Followed by 42nd MW (0.2/ plant) with meteorological parameters in the range of min. temp. of 31.41 °C and max. temp. of 34.11 °C with morning 93.29 % and evening 65.71 % humidity along with 41.00 mm rainfall.

Table 5: Incidence of lady bird beetle on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of LBB	Weather parameters				
				Temp Min	Temp Max	R.H (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.1	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.1	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.1	31.66	33.20	96.86	81.71	4.00
8	36	06.09.16	0.2	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.1	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.0	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.1	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.1	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.1	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.2	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	0.1	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	0.0	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	0.0	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.0	29.14	33.96	74.14	28.43	0.00
19	47	21.11.16	0.0	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	0.2	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.0	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R values				**0.2209**	**0.1581**	**0.1923**	**0.1540**	**-0.2169**

*Significant at 0.05% level (Table value-0.413)
** Highly significant at 0.01% level (Table value-0.526)

Lady bird beetle population recorded positive significant correlation with respect to morning and evening humidity on cotton crop. Population of spider was initiated in 34th MW (0.1/Plant) and continued up to 49th MW with disappearance in 35th to 36th, 38th to 39th and 45th to 47th MW. It was at its initial peak during 42nd MW (0.2/Plant) during which meteorological parameters in the range of min. temp. 31.41 °C and max. temp. of 34.11 °C with morning 93.29 % and evening 65.71 % humidity along with 41.00 mm rainfall. Sitaramaraju et

al. (2010) and Soujanya et al. (2010) observed the peak abundance of leafhoppers in 2nd week of October to 3rd week of November. It may be due to different crop season and agroecological conditions in that region as compared to region of our study. Umar et al. (2003) support the present findings that whitefly population was positively correlated with temperature and relative humidity. Shivanna et al. (2011) reported that whitefly population showed non-significant positive effect with relative humidity. Shahid et. Al (2012) reported that, the peak population of jassid, whitefly and mealybug was recorded during the months of August and September but thrips and mite's peak population was recorded during May and June periods.

Table 5: Incidence of Spider on cotton crop as influenced by different weather parameters

S.No	MW	Date of Observation	Average No of Spider	Weather Parameters				
				Temp Min	Temp Max	R.H (M)	R.H (E)	RF (mm)
1	29	-	0.0	31.83	32.90	97.43	89.43	212.7
2	30	-	0.0	31.99	33.84	97.29	78.71	39.40
3	31	01.08.16	0.0	31.84	33.13	99.86	88.57	141.4
4	32	08.08.16	0.0	31.67	32.97	100.0	89.29	76.50
5	33	16.08.16	0.0	31.60	32.83	99.14	88.57	23.50
6	34	22.08.16	0.1	31.84	33.49	90.86	75.14	0.10
7	35	29.08.16	0.0	31.66	33.20	96.86	81.71	4.00
8	36	06.09.16	0.0	32.04	33.81	98.29	81.14	15.30
9	37	12.09.16	0.1	31.67	34.03	92.57	66.29	0.00
10	38	19.09.16	0.0	32.21	34.10	90.29	73.00	3.50
11	39	26.09.16	0.0	32.24	33.66	97.71	81.43	61.30
12	40	03.10.16	0.1	31.96	33.94	96.14	77.00	36.20
13	41	10.10.16	0.1	31.84	33.60	96.43	80.71	3.60
14	42	17.10.16	0.2	31.41	34.11	93.29	65.71	41.00
15	43	24.10.16	0.1	30.26	34.67	85.14	41.86	0.00
16	44	31.10.16	0.2	30.41	34.29	80.86	41.29	0.00
17	45	07.11.16	0.0	29.83	33.89	82.14	40.71	0.00
18	46	14.11.16	0.0	29.14	33.96	74.14	28.43	0.00
19	47	21.11.16	0.0	28.86	33.37	83.14	39.86	0.00
20	48	26.11.16	0.1	28.59	33.76	78.00	33.43	0.00
21	49	06.12.16	0.2	28.61	34.16	82.00	36.00	0.00
22	50	12.12.16	0.0	28.06	33.40	84.86	39.00	0.00
R Values				**-0.1687**	**0.5836****	**-0.3016**	**-0.3324**	**-0.2850**

*Significant at 0.05% level (Table value-0.413)
** Highly significant at 0.01% level (Table value-0.526)

Correlation coefficient between different weather parameters and population of sucking aphid revealed that, maximum temperature recorded significant positive correlation with population of aphid. Thrips and white fly population had highly significant correlation with maximum temp having R value 0.6686 and 0.5707 respectively. Morning and evening relative humidity fly had significant negative correlation with population of sucking pests viz. aphid, leaf hopper, thrips and white fly. Regarding population a predator spider showed highly significant and positive correlation with maximum temp. Thus, our study showed the seasonal abundance and crucial role of different weather parameters on the population fluctuation sucking pests and their natural enemies in cotton agroecosystem which can be helpful in forecasting and formulating effective management strategies for these insect pests.

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