Cotton (Gossypium sp.) is known as "White Gold" and premier commercial fiber with oilseed crop grown under diverse agro-climatic conditions in India and around the world. It provides fiber, an important raw material for textile industry. Every parts of the cotton plant are useful to Indian farmers in one way or the other. The cotton seeds provide oil and their cake is used as cattle feed. The stalks are used as fuel and the leaves falling on the ground increase the content of organic matter in the soil. Further, Gujarat stands the second in respect of area (26.20 million ha) and the first in respect of production (106.82 lakh bale) of cotton in India with an average lint productivity of 693 kg/ha1 during 2010-11. Due to introduction of transgenic cotton in India, problem of bollworm complex has been solved up to greater extent. However, sucking insect pests viz., aphid, jassid, thrips and whitefly causes extensive damage throughout the crop period and become major pests of Bt cotton.

In cotton population build up of various insect pests has been found to be influenced by different parameters of climate. The insect being the member of biotic community interacts with other non living (abiotic) components of the environment. Hence the life system and abundance of insect pests can be understood by study of interaction between insect pests and abiotic factors. Hence, the studies on population dynamics of major sucking insect pests were conducted

MATERIALS AND METHODS

Field experiment was conducted at KVK Farm, JAU, Targhadia (Rajkot), in North Saurashtra Agro climatic Zone of Gujarat during Kharif 2012-13 on Bt cotton variety G Cot Hy 6 (BG II). The large plot size 13.50 m X 9.00 m which was non replicated. The sowing was done on 14th July, 2012 with row to row and plant to plant spacing of 120 cm x 45 cm in a large plot size 13.50 m X 9.00 m. Plot was divided in to ten quadrates. The observation on population of aphid, jassid, thrips and whitefly were recorded at weekly interval from three leaves (each from top, middle and bottom) on five randomly selected plants from each quadrate. All the recommended agronomical practices were followed to raise the good crop. The data pertaining to population dynamics of the sucking pests were correlated with various environmental factors.
Table-1. Population dynamics of major sucking insect pests on Bt cotton G Cot Hy 6 (BG II) during Kharif - 2012-13

<table>
<thead>
<tr>
<th>Standard Week</th>
<th>No. of aphids/3 leaves/plant</th>
<th>No. of jassid nymphs/3 leaves/plant</th>
<th>No. of thrips/3 leaves/plant</th>
<th>No. of whitefly/3 leaves/plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>0.0</td>
<td>0.6</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>34</td>
<td>0.0</td>
<td>1.6</td>
<td>2.6</td>
<td>1.5</td>
</tr>
<tr>
<td>35</td>
<td>0.0</td>
<td>3.0</td>
<td>4.9</td>
<td>2.2</td>
</tr>
<tr>
<td>36</td>
<td>0.0</td>
<td>2.4</td>
<td>8.4</td>
<td>3.4</td>
</tr>
<tr>
<td>37</td>
<td>0.8</td>
<td>3.5</td>
<td>18.2</td>
<td>4.3</td>
</tr>
<tr>
<td>38</td>
<td>1.7</td>
<td>3.3</td>
<td>28.7</td>
<td>5.0</td>
</tr>
<tr>
<td>39</td>
<td>3.4</td>
<td>4.8</td>
<td>54.4</td>
<td>7.6</td>
</tr>
<tr>
<td>40</td>
<td>5.8</td>
<td>5.4</td>
<td>36.5</td>
<td>9.8</td>
</tr>
<tr>
<td>41</td>
<td>7.4</td>
<td>5.2</td>
<td>26.2</td>
<td>10.6</td>
</tr>
<tr>
<td>42</td>
<td>10.2</td>
<td>7.6</td>
<td>28.2</td>
<td>12.9</td>
</tr>
<tr>
<td>43</td>
<td>17.5</td>
<td>9.7</td>
<td>25.6</td>
<td>11.7</td>
</tr>
<tr>
<td>44</td>
<td>23.1</td>
<td>12.4</td>
<td>20.1</td>
<td>14.4</td>
</tr>
<tr>
<td>45</td>
<td>26.7</td>
<td>14.8</td>
<td>18.4</td>
<td>18.3</td>
</tr>
<tr>
<td>46</td>
<td>35.9</td>
<td>11.4</td>
<td>12.8</td>
<td>21.1</td>
</tr>
<tr>
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<td>37.3</td>
<td>9.5</td>
<td>10.9</td>
<td>17.8</td>
</tr>
<tr>
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<td>7.4</td>
<td>7.8</td>
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</tr>
<tr>
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<td>6.1</td>
<td>8.6</td>
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</tr>
<tr>
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<td>8.1</td>
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</tr>
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<td>2.1</td>
</tr>
<tr>
<td>4</td>
<td>10.2</td>
<td>0.0</td>
<td>1.8</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Table-2. Correlation co-efficients between population of major sucking pests of Bt cotton and weather parameters during Kharif - 2012-13

<table>
<thead>
<tr>
<th>Name of sucking pest</th>
<th>Temperature (°C)</th>
<th>Relative humidity (%)</th>
<th>Mean bright sunshine hours (hrs/day)</th>
<th>Rainfall (mm)</th>
<th>Rainy days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max.</td>
<td>Min.</td>
<td>Morning (08:00 hr)</td>
<td>Afternoon (14:00 hr)</td>
<td>X₁</td>
</tr>
<tr>
<td>Aphid</td>
<td>-0.2581</td>
<td>-0.3846</td>
<td>-0.7386**</td>
<td>-0.6397**</td>
<td>0.6477**</td>
</tr>
<tr>
<td>Jassid</td>
<td>0.4420*</td>
<td>0.1379</td>
<td>-0.5265*</td>
<td>-0.5968**</td>
<td>0.1938</td>
</tr>
<tr>
<td>Thrips</td>
<td>0.6374**</td>
<td>0.5435**</td>
<td>0.2531</td>
<td>0.1710</td>
<td>-0.2730</td>
</tr>
<tr>
<td>Whitefly</td>
<td>0.5174**</td>
<td>0.2285</td>
<td>-0.3892</td>
<td>-0.4038</td>
<td>0.1783</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level  ** Highly Significant at 0.01 level
Aphid (n=20) (r=0.444), Aphid (n=20) (r=0.561), Jassid (n=21) (r=0.433), Jassid (n=21) (r=0.549), Thrips and Whitefly (n=24) (r=0.404) Thrips and Whitefly (n=24) (r=0.515)
RESULTS AND DISCUSSION

Aphid (Aphis gossypii Glover): The population of aphid ranged from 0.8 to 37.3/3 leaves/plant (Table-1). The activity of aphid initiated in 37th std. week (0.8) i.e. 9 week after sowing (2nd week of September) on the Bt cotton. After commencement the aphid population multiplied continuously and reach at a peak (37.3 aphid/3 leaves) in 47th std. week i.e. 19th week after sowing (3rd week of November). Further it was found that the major activity of aphid 10.2 to 37.3 aphid/3 leaves was recorded on the Bt cotton during 3rd week of October to 4th week of January.

The severe infestation of aphid was also reported during 46th std. week to end of season with maximum population (98.6 aphids/3 leaves) during 49th std. week on cotton at Surat in Gujarat. It was also obserbed that Major activity of aphid on Bt cotton from 41st standard week attaining peak during 46th standard week. Further it was also obserbed that initial incidence of cotton aphid on 34th standard week (4th week of August) and the peak incidence was observed from 39th standard week (4th week of September) to 46th standard week (3rd week of November).

Aphid population had exhibited highly significant negative correlation with morning relative humidity (r= -0.7386) and afternoon relative humidity (r= -0.6397) and positive with bright sunshine hours (r = 0.6477). Whereas, it was significantly negative correlated with rainy days (r = 0.4780) and non-significantly negative with maximum temperature (r = 0.2581), minimum temperature (r = -0.3846) and rainfall (r = -0.4016) (Table 2). Similar observations were also reported by some workers.

Jassid (Amrasca biguttula biguttula, Ishida): The population of jassid ranged from 0.6 to 14.8 /3 leaves/plant (Table-1). The jassid initiated its activity in 33rd std. week (0.6 nymph/3 leaves) i.e. 5 week after sowing (2nd week of August) on the Bt cotton. After commencement of jassid on the crop, its population multiplied continuously to reach at a peak (14.8 nymph/3 leaves) in 45th std. week i.e. 17th week after sowing (1st week of November). The major activity of jassid (7.6 to 14.8 nymph/3 leaves) on the Bt cotton was from 42nd to 48th std. week where the crop was in vegetative growth stage.

The severe infestation of jassid from 38th to 44th std. week with maximum population (10.8 nymph/3 leaves) in 43rd std. week was recorded on cotton at Surat in Gujarat. High activity of jassid on Bt cotton from 41st to 48th std. week with peak population at 45th std. week also recorded. Further Soujanya et al. (2010) reported higher jassid population (above economic threshold level) from 42nd to 47th standard week. In the present study higher jassid population was recorded from 42nd to 48th std. week.

Jassid population had exhibited highly significant negative correlation with afternoon relative humidity (r = -0.5968) and significantly positive correlation with maximum temperature (r = 0.4420) and negative with morning relative humidity (r = -0.5205). Rest of parameters viz., rainfall and rainy days were negative and minimum temperature and bright sunshine hours exhibited positive but non significant correlation with jassid (Table-2).

Significant positive relationship between jassid population on okra and maximum temperature (r = 0.76) as well as hours of bright sunshine (r = 0.82) was recorded. Positive correlation of jassid population on cowpea with maximum temperature and negative with relative humidity and minimum temperature was reported. Some researchers recorded significant negative correlation of jassid on Bt cotton with morning and evening relative humidity

Thrips (Thrips tabaci Lindeman): The population of thrips ranged from 0.6 to 54.4/3 leaves/plant (Table-1). The thrips initiated its activity in 33rd std. week (0.6 thrips/3 leaves) i.e. 5 week after sowing (2nd week of August) on the Bt cotton. After commencement of thrips on the crop, its population multiplied continuously to reach at a peak (54.4 thrips/3 leaves) in 39th std. week i.e. 11th week after sowing (4th week of September). The major activity of thrips (10.9 to 54.4 thrips/3 leaves) on the Bt cotton was from 37th to 47th std. week.

Populations of thrips on cotton started to build up in July and reached a peak in August and September and declined in the first week of October and it was low during end of October was recorded. The peak incidence of thrips on cotton was recorded from the 35th to 39th std. week. It was reported the peak incidence of thrips on Bt cotton in 38th std. week. In the present study higher thrips population was recorded from 37th to 47th std. week.

Thrips population had exhibited highly significant positive correlation with maximum temperature (r= 0.6374) and minimum temperature (r= 0.5435). Rest of parameters viz., bright sunshine hours, rainfall and rainy days were negative and relative humidity exhibited positive but non significant
correlation with thrips (Table-2).

Significant positive correlation was observed between thrips population and weather parameters viz., minimum temperature, RH at morning and evening and rainy days on cotton. It was recorded significant negative influence of thrips on Bt cotton with morning relative humidity, whereas maximum and minimum temperatures were found positive and significant. Highly significant positive correlation of thrips on cotton with maximum temperature, minimum temperature, evening relative humidity and rainfall was recorded.

**Whitefly (Bemisia tabaci Gennadius):** The population of whitefly ranged from 0.4 to 21.1 leaves/plant (Table-1). The whitefly initiated its activity in 33rd std. week (0.4 whitefly/3 leaves) i.e. 5 week after sowing (2nd week of August) on the Bt cotton. After commencement of whitefly on the crop, its population multiplied continuously to reach at a peak (21.1 whitefly/3 leaves) in 46th std. week i.e. 18th week after sowing (2nd week of November). The major activity of whitefly (10.6 to 21.1 whitefly/ 3 leaves) on the Bt cotton was from 41st to 48th std. week.

The incidence of whitefly on cotton was observed from 32nd to 52nd std. weeks but found severe during 45th to 48th std. weeks with highest population (36.5 whitefly/3 leaves). The peak incidence of whitefly on cotton from the 44th to 48th standard week (November) was recorded. The incidence of whitefly on Bt cotton low throughout the season with peak incidence in 46th standard week was observed. Some workers recorded the peak incidence of cotton whitefly on 44th to 48th standard week.

Whitefly population had exhibited highly significant positive correlation with maximum temperature (r=0.5174) and significantly negative correlation with rainy days (r=-0.4329). Rest of parameters viz., relative humidity and rainfall were negative and minimum temperature and bright sunshine hours exhibited positive but non significant correlation with whitefly (Table-2).

Positive correlation of the maximum temperature with population of whitefly on cotton has also been recorded. It was reported that maximum and minimum temperatures were positively correlated with whitefly on cowpea.

**REFERENCES**


