Population Dynamics of Sucking Pests in relation to Weather Parameters in Groundnut (Arachis hypogaea L.)

KC Ahir, Arti Saini, BS Rana and NL Dangi

Abstract
Population dynamics of sucking pests of groundnut was studied during July to October 2014, at Research farm, CTAE, Udaipur. Three pests viz. aphid (Aphis craccivora Koch), jassid (Empoasca kerri Pruthi) and thrips (Scirtothrips dorsalis Hood) were recorded. Incidence of aphid, jassid and thrips started in 2nd week of August. Aphid (7.60 aphids/3 leaves) touched the peak in the 3rd week of September; whereas, Jassid (7.00 jassids/3 leaves) and thrips (3.80 thrips/3 leaves) attained peak in the 2nd week of September. The population of aphid exhibited a negative correlation with temperature and rainfall, whereas positive correlation with relative humidity. However, the correlation was non-significant. Jassid population showed negative correlation with temperature, whereas relative humidity and rainfall were found non-significant and positive. The correlation between thrips population and temperature was negative but with total rainfall, the correlation was positive and non-significant and correlation with relative humidity was positively significant.

Keywords: Aphid, correlation, groundnut, incidence, significant

1. Introduction
Groundnut (Arachis hypogaea L.) is an annual legume crop, also known as peanut earthenut, monkey-nut and goobers. It forms the world’s largest source of edible oil and ranks 13th among the food crops and is also 4th most important oilseed crop of the world [1]. It is grown in tropical and subtropical countries. Cultivated groundnut has been reported to from South America [2]. Asia posses 1st rank in area (63.4%) and production (71.1%). Major groundnut countries are India (26%), China (19%) and Nigeria (11%). In India, it is cultivated in an area of 4.72 M ha with production of 4.70 MT and productivity is 995 kg ha⁻¹ [3]. In India, it is mainly grown in the southern and north-western states; Gujrat, Andhra Pradesh, Tamil nadu, Karnataka, Maharashtra, and Madhya Pradesh, together occupying about 90 percent of the groundnut area in the country. The major insect pest of groundnut are the groundnut aphid (Aphis craccivora Koch), leaf minor (Stomopteryx nertara meyrick), stem borer (Sphenoptera perotett camron), white grub (Holotrichia consainguina Blanchard), bihar hairy caterpillar (Spilosoma oblique walker), tobaco cater pillar (Spodoptera litura Fab.), red hairy caterpillar (Ansamta albistriga Butler), jassid (Empoasca kerri Pruthi), thrips (Scirtothrips dorsalis), termite (Odontotermes obesus Rambur) [4]. However, aphid was not considered to be a serious pest of groundnut until late 1980 [5]. The aphid (A. craccivora), besides causing direct damage to the crop by sucking the sap, is also responsible for the causing rosette viral diseases [6-9]. The knowledge of seasonal incidence of insect pests at different growth stages of groundnut crop will be helpful in evolving proper management schedule. Therefore, a region oriented study on population dynamics of sucking pests was conducted which would give an idea about peak period of their activity and may be helpful in developing pest management strategies.

2. Material and Methods
2.1 Location
The experiment was conducted during Kharif, 2014 at College of Technology and Engineering (CTAE), MPUAT, Udaipur to investigate the “Population dynamics of sucking Pests in relation to weather parameters in Groundnut (Arachis hypogaea L.)”.

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2.2 Variety and Sowing
Groundnut variety Pratap Munghali-1 was sown under natural conditions without spraying the insecticides in plot size 5 m x 4 m with 30 cm row to row and 10 cm plant to plant spacing. All recommended agronomical practices were applied.

2.3 Observation
The population of sucking pests viz., aphid (A. craccivora), jassid (E. kerri) and thrips (S. dorsalis) were recorded at weekly intervals during morning hours between 7.00 am to 9.00 am on five randomly selected and tagged plants in each plot by using sampling techniques [10]. Population was counted on three leaves.

2.4 Statistical Analysis
The data were subjected to statistical analysis and correlation coefficient was worked out. Simple correlation was worked out between the population of insect pests and abiotic factors by the Karl Pearson’s coefficient of correlation formula [11]:

\[ r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[ \sum X^2 - \frac{\left( \sum X \right)^2}{n} \right] \left[ \sum Y^2 - \frac{\left( \sum Y \right)^2}{n} \right]}} \]

Where,
- \( r_{xy} \) = Simple correlation coefficient
- \( X \) = Variable i.e. abiotic component.
- \( Y \) = Variable i.e. mean number of insect pests per plant
- \( n \) = Number of observations.

The correlation coefficient \( r \) values were subjected to the test of significance using t-test:

\[ t = \frac{r}{\sqrt{1 - r^2}} \times \sqrt{n - 2} \approx t_{n-2} \text{ d.f.} \]

The calculated t-value obtained was compared with tabulated t-value at 5% level of significance.

3. Results and Discussion
The mean population of aphid (A. craccivora), jassid (E. kerri) and thrips (S. dorsalis) is presented in Table 1. During the course of investigation, aphid, A. craccivora; jassid, E. kerri and thrips, S. dorsalis were recorded as major insect pests of groundnut.

3.1 Aphid [Aphis craccivora (Koch)]
The aphid appeared during 32nd standard meteorological week (SMW) i.e. 6th-12th August (2nd week) with a mean population of 2.20 aphid/3 leaves. The population increased gradually and attained its peak in the third week of September (38th SMW) with a mean population of 7.60 aphid/3 leaves, when the mean atmosphere temperature and relative humidity were 26.15 °C and 68.05%, respectively. Thereafter, the population declined and reached to minimum levels of 1.00 aphid/3 leaves during 43rd SMW i.e. 22nd-28th October. Aphid population showed non-significant correlation with mean atmosphere temperature, relative humidity and rainfall, while relative humidity favours the pest multiplication. Similarly higher incidence of A. craccivora was observed in mid-September [12]. The temperature and relative humidity favours the pest population build up [13]. However it was adversely affected at 45 per cent relative humidity. The aphid population touched the peak during the fourth week of September (15.05 aphid/3 leaves) and exhibited a negative correlation with temperature, relative humidity and rainfall.

3.2 Jassid, Empoasca kerri (Pruthi)
The jassid first appeared during 32nd standard meteorological week (SMW) i.e. 6th-12th August with a mean population of 1.60 jassid/3 leaves. The population increased slowly and reached to its peak in the second week of September (10th-16th Sep.) with a mean population of 7.00 jassid/3 leaves, when the mean atmosphere temperature, relative humidity and rainfall were 25.05 °C, 87.65% and 94.80 mm, respectively. Thereafter, the population declined and reached minimum levels of 0.80 jassid/3 leaves during 43rd SMW i.e. 22nd-28th October (4th week). The pest population showed negative correlation with mean atmosphere temperature while, positive correlation with relative humidity and rainfall. Similarly, the highest nymphal population of jassid in cotton and okra were recorded in the first week of August [17]. The population built up showed negative relationship with mean temperature and positive correlation with the minimum temperature as well as relative humidity. Incidence of jassid was high during the mid-September, which might be due to local weather conditions that prevailed during the study period [18]. The incidence of the jassids in groundnut commenced from the third week of sowing i.e. the 3rd week of July, which gradually increased and attained a first peak during the 2nd week of September i.e. the 10th week of sowing [19]. The population of leaf hopper in groundnut had negative correlation with minimum temperature, rainfall and sunshine hour, positive correlation with maximum temperature [15]. The incidence of jassid (E. kerri) started in second week of August and peaked in the second week of September with a mean population of 13.56 jassids/3 leaves. The population of jassids showed a non significant and positive correlation with relative humidity and rainfall, whereas temperature was found non significant and negative correlation [16].

3.3 Thrips, Scirtothrips dorsalis (Hood)
The thrips first appeared during 32nd standard meteorological week (SMW) i.e. 6th-12th August (2nd week) with a mean population of 0.80 thrips/3 leaves. The population increased and reached its peak in the second week of September (10th-16th Sep.) with a mean population of 3.80 thrips/3 leaves, when the mean atmosphere temperature, relative humidity and rainfall were 25.05 °C, 87.65% and 94.80 mm, respectively. Later on, the population declined to a minimum level of 0.40/3 leaves during 43rd SMW i.e. 22nd-28th October. The pest exhibited significant positive correlation with relative humidity \( r = 0.6062 \) while, non-significant correlation with mean atmosphere temperature and rainfall. The incidence of
Thrips was high during September, which might be due to local weather conditions that prevailed during the study period [15]. The thrips population touched the peak during the fourth week of September (4.16 thrips/3 leaves) and the correlation between thrips and temperature was negative but with relative humidity and total rainfall, the correlation was positive and non significant [14]. Population of thrips was more abundant on the groundnut crop during August and September. Population of thrips had showed negative correlation with rainfall and positive correlation with maximum and minimum temperature [15]. Incidence of thrips started in 2nd week of August and peak in the fourth week of September with a mean of 4.16 thrips/3 leaves. The Thrips population shows that a non significant positively correlation with relative humidity and rainfall, while a non significant and negative correlation with temperature [16].

**Table 1:** Seasonal incidence of major sucking insect pests infesting groundnut variety “Pratap Mungphali-1” during kharif, 2014

<table>
<thead>
<tr>
<th>SMW No.</th>
<th>Date</th>
<th>Mean Temperature (°C)</th>
<th>Mean Relative Humidity (%)</th>
<th>Rainfall (mm)</th>
<th>Average number of sucking insect pests on 3 leaves</th>
<th>Coefficient of correlation (r) for population and mean atm. temperature</th>
<th>Coefficient of correlation (r) for population and mean relative humidity</th>
<th>Coefficient of correlation (r) for population and total rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>6 Aug-12 Aug</td>
<td>25.85</td>
<td>81.30</td>
<td>47.20</td>
<td>2.20</td>
<td>3.60</td>
<td>0.3426</td>
<td>-0.0084</td>
</tr>
<tr>
<td>33</td>
<td>13 Aug-19 Aug</td>
<td>26.55</td>
<td>72.70</td>
<td>0.20</td>
<td>2.80</td>
<td>3.60</td>
<td>0.3426</td>
<td>-0.0084</td>
</tr>
<tr>
<td>34</td>
<td>20 Aug-26 Aug</td>
<td>28.15</td>
<td>76.35</td>
<td>40.80</td>
<td>2.00</td>
<td>7.60</td>
<td>0.80</td>
<td>-0.0293</td>
</tr>
<tr>
<td>35</td>
<td>27 Aug-2 Sept</td>
<td>27.40</td>
<td>77.35</td>
<td>31.60</td>
<td>3.40</td>
<td>5.20</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>36</td>
<td>3 Sept-9 Sept</td>
<td>25.95</td>
<td>82.70</td>
<td>165.2</td>
<td>2.20</td>
<td>4.80</td>
<td>1.60</td>
<td>0.00</td>
</tr>
<tr>
<td>37</td>
<td>10 Sept-16 Sept</td>
<td>25.05</td>
<td>87.65</td>
<td>94.80</td>
<td>4.80</td>
<td>7.00</td>
<td>3.80</td>
<td>0.00</td>
</tr>
<tr>
<td>38</td>
<td>17 Sept-23 Sept</td>
<td>26.15</td>
<td>68.05</td>
<td>0.00</td>
<td>7.60</td>
<td>5.20</td>
<td>1.60</td>
<td>0.00</td>
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<tr>
<td>39</td>
<td>24 Sept-30 Sept</td>
<td>25.60</td>
<td>64.25</td>
<td>0.00</td>
<td>3.60</td>
<td>4.80</td>
<td>2.20</td>
<td>0.00</td>
</tr>
<tr>
<td>40</td>
<td>1 Oct-7 Oct</td>
<td>26.95</td>
<td>59.55</td>
<td>0.00</td>
<td>2.00</td>
<td>3.00</td>
<td>1.40</td>
<td>0.00</td>
</tr>
<tr>
<td>41</td>
<td>8 Oct-14 Oct</td>
<td>26.25</td>
<td>56.50</td>
<td>0.00</td>
<td>2.00</td>
<td>2.20</td>
<td>1.00</td>
<td>0.00</td>
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<tr>
<td>42</td>
<td>15 Oct-21 Oct</td>
<td>25.05</td>
<td>54.00</td>
<td>0.00</td>
<td>1.80</td>
<td>1.60</td>
<td>0.60</td>
<td>0.00</td>
</tr>
<tr>
<td>43</td>
<td>22 Oct-28 Oct</td>
<td>24.90</td>
<td>46.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.80</td>
<td>0.40</td>
<td>0.00</td>
</tr>
</tbody>
</table>

* Significant at 5% level of significance

### 4. Conclusion

The study revealed that the incidence of aphid (*A. craccivora*), jassid (*E. kerrii*) and thrips (*S. dorsalis*) was commenced in 2nd week of August. The population of jassids (7.00 jassid/3 leaves), thrips (3.80 thrips/3 leaves) peak in 2nd week of September and aphid in the 3rd week of September (7.60 aphid/3 leaves). This will help us in scheduling sucking pests management strategies in groundnut crop.

### 5. Acknowledgements

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### 6. References

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