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

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Abstract

Population dynamics of sucking pests of groundnut was studied during July to October 2014, at Reasearch 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 earthnut, monkey-nut and goobers. It forms the world' 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, Maharastra, 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 consanguinia* Blanchard), bihar hairy caterpillar (*Spilosoma oblique* walker), tobbaco cater pillar (*Spodoptera litura* Fab.), red hairy caterpillar (*Amsacta 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.)".

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]:

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

Where,

- r_{xy} = Simple correlation coefficient
 X = Variable i.e. abiotic component.
 (Average temperature, relative humidity and total rainfall)
 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:

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2} \sim t_{n-2} \text{ d.f.}$$

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. However, the correlation was non-significant [14]. The population of aphids in groundnut had negative correlation with maximum temperature, rainfall and sunshine hour, positive correlation with minimum temperature [15]. The aphid (*A. craccivora*) appeared in 3rd week of August and population of aphid touched the peak in the last week of September with a mean population of 15.05 aphids/ 3 leaves, the population of aphid exhibited a non significant negative correlation between mean population of aphids and relative humidity whereas average temperature was found to be non significant and negatively correlated [16].

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 peak 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 [16]. 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

SMW No.	Date	Mean Temperature (°C)	Mean Relative Humidity (%)	Rainfall (mm)	Average number of sucking insect pests on 3 leaves		
					Aphids	Jassids	Thrips
32	6 Aug-12 Aug	25.85	81.30	47.20	2.20	1.60	0.80
33	13 Aug-19 Aug	26.55	72.70	0.20	2.80	1.80	1.20
34	20 Aug-26 Aug	28.15	76.35	40.80	2.00	1.40	1.40
35	27 Aug-2 Sept	27.40	77.35	31.60	3.40	2.00	2.00
36	3 Sept-9 Sept	25.95	82.70	165.2	2.20	3.20	1.40
37	10 Sept-16 Sept	25.05	87.65	94.80	4.80	7.00	3.80
38	17 Sept-23 Sept	26.15	68.05	0.00	7.60	5.20	1.60
39	24 Sept-30 Sept	25.60	64.25	0.00	3.60	4.80	2.20
40	1 Oct-7 Oct	26.95	59.55	0.00	2.00	3.00	1.40
41	8 Oct-14 Oct	26.25	56.50	0.00	2.00	2.20	1.00
42	15 Oct-21 Oct	25.05	54.00	0.00	1.80	1.60	0.60
43	22 Oct-28 Oct	24.90	46.00	0.00	1.00	0.80	0.40
Coefficient of correlation (r) for population and mean atm. temperature					-0.0293	-0.2814	-0.0147
Coefficient of correlation (r) for population and mean relative humidity					0.3426	0.3995	0.6062*
Coefficient of correlation (r) for population and total rainfall					-0.0084	0.2774	0.3658

* Significant at 5% level of significance

4. Conclusion

The study revealed that the incidence of aphid (*A. craccivora*), jassid (*E. kerri*) 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.

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