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Seasonal incidence of sucking insect pests infesting groundnut crop at Raipur (Chhattisgarh)

Tarun Kumar Nayak, Sonali Deole, SS Shaw and Nandan Mehta

Abstract
The field experiment was conducted at Research Cum Instructional Farm at IGKV, Raipur (C.G.) during *kharif* 2018, to know the seasonal incidence of sucking pests viz…aphid (*Aphis craccivora*), thrip (*Scirtothrips dorsalis*) and hoppers (*Empoasca kerri*) infesting groundnut. Aphid, thrips and hoppers appeared during 33rd standard meteorological week (SMW) i.e. 13th-19th August (2nd week). The peak population of aphid were observed in the first week of September with a mean population of 8.48 top 2cm shoot. Whereas, the peak population of thrips (3.84/top bud leaves) and hoppers (5.68/top 3 leaves) were observed in the second week of September.
The correlation between hoppers, *E. kerri* and weather parameters during *kharif* 2018 results indicated that the population demonstrated a significant positive association with minimum temperature (r = 0.610) and mean temperature (0.575), while thrips, *S. dorsalis* also showed significant positive association with minimum temperature (r = 0.681) and mean temperature (0.606).

Keywords: Aphid, correlation, groundnut, hoppers, incidence, thrips

1. Introduction
Groundnut (*Arachis hypogaea* L.) also known as peanut is a member of leguminoceae (Papilionaceae). The oil content of the groundnut seed varies from 44 to 50%.
The major growing states are Andhra Pradesh, Gujarat, Tamil Nadu, Karnataka, Rajasthan, and Maharashtra and together they account for around 80% of area and production [1]. Groundnut is cultivated on 27.6 million ha with an annual production of 43.9 million metric tons globally [2]. In India, groundnut is cultivated an area of 5.8 million ha, production of 6.85 million tones, and an average yield of 1182 kg /ha [2].
Many insect pests damages the groundnut crop, in which leafminer, white grub, jassids, thrips, aphid, tobacco caterpillar, gram caterpillar, red hairy caterpillar and termites are found to be economically important. The aphid (*A. craccivora)* sucking the sap from the crop and also responsible for the causing rosette viral diseases. Thrips damage plants by sucking their juices and scraping at fruits, flowers and leaves. When the plant is disturbed jassids fly from one plant to another plant canopy. Both adults and nymphs suck sap from the young leaves, mostly from the lower leaves surfaces. The whitening of the veins is the first symptom of attack. Yellow patches then appear, especially at the tips of leaflets after that hopper burn symptoms appear in case of severe infestations.
The studies on seasonal incidence of insect pests and their natural enemies of groundnut crop and their correlation with the weather parameters provide basic information about seasonal occurrence of insect pests and their natural enemies. This provides an opportunity for the development of management strategies significant for the control of these pests. These studies will support in devising the pest monitoring system and ecological sound integrated pest management modules.

2. Materials and Methods
A field experiment was conducted at Research Cum Instructional Farm at IGKV, Raipur, (C.G.) during *kharif* 2018 under field condition to know the occurrence of insect pests on groundnut. The popular groundnut variety Jyoti was sown during *kharif* 2018 under natural conditions without spraying the insecticides in an area of 20 × 10 m. to record the incidence of insect pests.

To determine the seasonal incidence of insect pests on groundnut crop, weekly populations were recorded on randomly selected twenty five plants from four corners and center starting from 15 days after germination to the late stage of the cropping season.

The population of sucking pests viz., aphids, hoppers and thrips were recorded at weekly intervals during morning hours. Thrips population were recorded by counting top three bud leaves of five plants at each quadrate using 10X magnification lens.

Leafhopper population was recorded by visual observing on five plants at each quadrate without disturbing the plant. Aphid population was recorded on top 2 cm shoot length of five plants at each quadrate.

The data was statistically analysed by subjecting to the correlation between weather parameters and the population of insect pests which were determined using the Karl Pearson's coefficient of correlation formula:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{N}\right)\left(\sum Y^2 - \frac{(\sum Y)^2}{N}\right)}}$$

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:

$$t = \frac{r_{xy}\sqrt{n-2}}{\sqrt{1-r_{xy}^2}} \quad \sim t\ n\text{-}2\ d.f.$$

Where,

r = Correlation Coefficient

n = No. of observations

The calculated t-value obtained was compared with correlation coefficient table value at 5 % and 1% 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 33rd standard meteorological week (SMW) *i.e.* 13th-19th August (2nd week) with a mean population of 0.84 aphid / top 2 cm shoot. The population build up gradually and reached to its peak in the first week of September (36th SMW) with a mean population of 8.48 aphids / top 2 cm shoot, when the mean atmospheric temperature, rainfall and relative humidity were 26.55°C, 30.2 mm and 75 per cent, respectively. Then, the population declined and reached to its minimum levels of 0.84 aphid / top 2 cm shoot during 39th SMW *i.e.* 24th -30th September. The findings indicated that the population of aphid revealed non significant negative correlation with maximum temperature, mean temperature, rainfall, wind velocity and sunshine hour, while non significant positive correlation with minimum temperature, morning and evening relative humidity and mean relative humidity.

These present results are similar with the [3], who studied that population of aphids had negative non-significant correlation with maximum temperature, rainfall and sunshine hours whereas, positive non-significant correlation with minimum temperature. The maximum temperature showed negative correlation with aphid population and is in accordance with [4]. These results in contrary with the [5] who reported that significantly negative correlation was observed in rainfall, morning relative humidity, minimum temperature and sunshine hours with aphid incidence. These results are also in contrary with the [6], who reported that the maximum temperature had significant but negatively correlated (r = -0.682) whereas, relative humidity showed significant positive correlation (r = 0.671) with aphid population. But, their results are agreement with the present findings that the results exhibit a non significant relationship of cowpea aphid, *A. craccivora* with minimum temperature and rainfall.

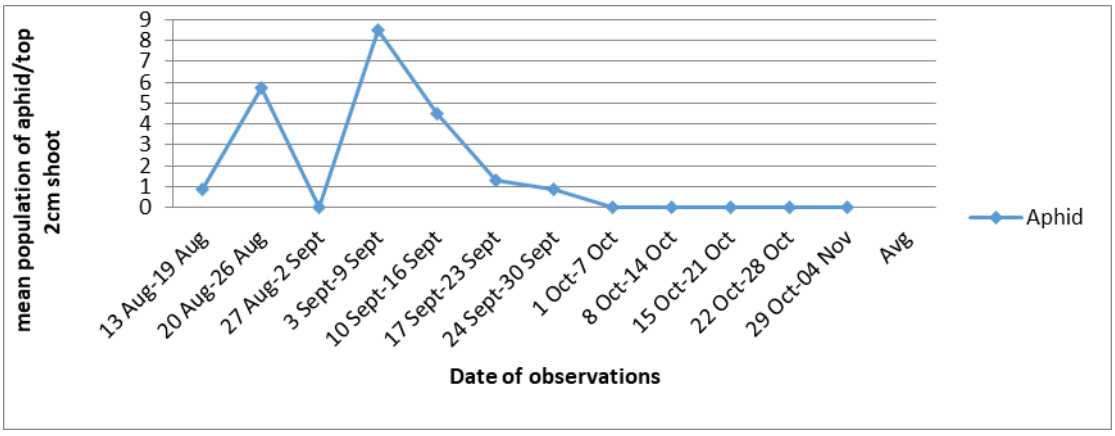


Fig 1: Mean population of Aphid, *A. craccivora* during *kharif* 2018

3.2 Hoppers, *Empoasca kerri* (Pruthi)

The hoppers appeared during 33rd standard meteorological week (SMW) *i.e.* 13th -19th August (2ndweek) with a mean population of 1.68 hoppers/ top 3 leaves. The population increased gradually and attained its peak in the second week of September (37th SMW) with a mean population of 5.68 hoppers/ top 3 leaves, when the mean atmospheric temperature, rainfall and relative humidity were 28.85°C, 0

mm and 72.5%, respectively. Thereafter, the population declined and reached to minimum levels of 0.92 hopper/ top 3 leaves during 43th SMW *i.e.* 22th-28th October. The results indicated that the hoppers population showed significant positive correlation with minimum temperature (r = 0.610) (Fig-3). The regression equation being y=8.9817-0.498x indicating that with an increase in 1 ^{0}C temperature there will be increase in population by 0.498. The hopper population also showed significant positive correlation with mean temperature (r = 0.575) (Fig-3). The regression equation being y=20.231-0.835x indicating that with an increase in 1 ^{0}C temperature there will be increase in population by 0.835, while other parameters has non significant association. Thus, hoppers showed direct effect with temperature changes.

These findings are in agreement with the [3], who studied that the peak population of jassid was found in the second week of September (10th-16th Sep.). They also reported that population of jassids showed a non significant and positive correlation with relative humidity and rainfall while, temperature was found non significant and negative correlation. These findings are also in accordance with the findings of [7] in blackgram who reported that population of leafhopper, (*Empoasca kerri*) with sunshine hours showed non-significant negative correlation while rainfall, temperature (Minimum and maximum), relative humidity (Morning and evening) and wind velocity showed a non significant positive correlation. These findings are also in accordance with the findings of [5], who reported that hoppers showed negative correlation with rainfall, sunshine hours and maximum temperature has shown positive correlation with hoppers population (r = 0.314). These findings are also in accordance with the findings of [8] in onion who reported that the jassids population showed significantly positive correlated with minimum temperature (r= 0.497) and the negatively non significant correlation with rainfall (r= -0.285) and non significant positively correlated with evening relative humidity (r=0.198). More or less these findings are also in accordance with the findings of [9] on soybean who reported that correlation between population of jassids and minimum temperature, average temperature, morning and evening relative humidity and sunshine hours were positively but non-significant during *kharif* 2003. Whereas, correlation between jassids population and maximum temperature, rainfall and rainy days were negatively non-significant during *kharif*.

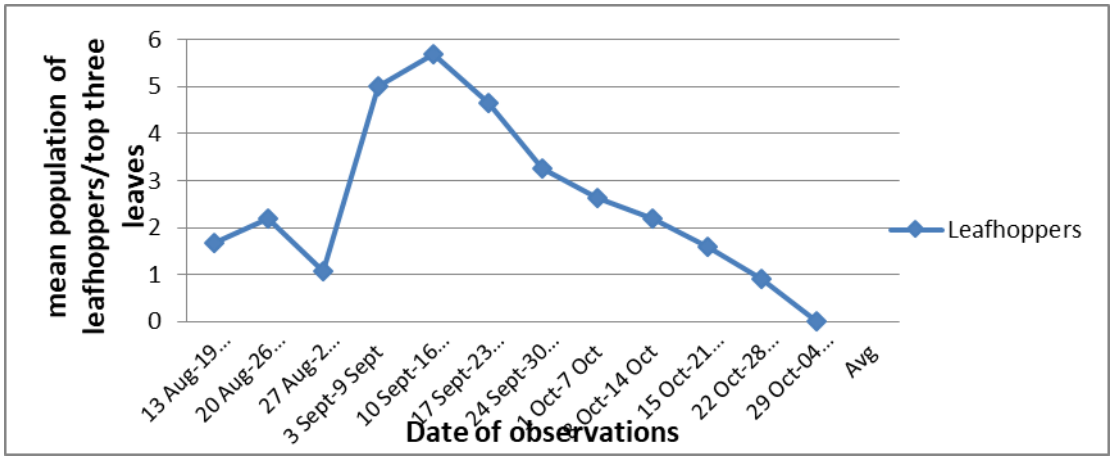


Fig 2: Mean population of hoppers, *E. kerri* during *kharif* 2018

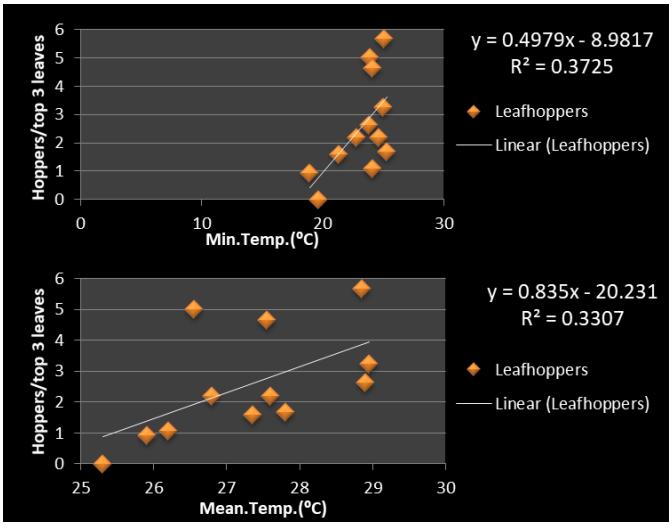


Fig 3: Regression equation between weather parameters and population buildup of hoppers, *E. kerri.*

3.3 Thrips, *Scirtothrips dorsalis* (Hood)

The thrips appeared during 33rd standard meteorological week (SMW) *i.e.* 13th-19th August (2nd week) with a mean population of 0.64 thrips/ top bud leaves. The population increased gradually and attained its peak in the second week of September (37th SMW) with a mean population of 3.84 thrips/ top bud leaves, when the mean atmospheric temperature, rainfall and relative humidity were 28.85°C, 0 mm and 72.5%, respectively. Thereafter, the population declined and reached to minimum levels of 0.44 thrips/ top bud leaves during 43th SMW *i.e.* 22th-28th October. The results indicated that thrips population showed significant positive correlation with minimum temperature (r=0.681) (Fig-5). The regression equation being y=6.234-0.333x indicating that with an increase in 1 ^{0}C temperature there will be increase in population by 0.333. The thrips population also showed significant positive correlation with mean atmospheric temperature (r=0.606) (Fig-5). The regression equation being y=12.927-0.528x indicating that with an increase in 1 ^{0}C temperature there will be increase in population by 0.528. While other parameters has non significant association.

These findings are in agreement with the [3], who studied that the peak population of thrips are found in the second week of September (10th-16th Sep.) and also reported that the population of thrips exhibited a non significant positive correlation between rainfall and relative humidity, whereas mean atmospheric temperature was found to be non significant negative correlation. The present findings are also

in agreement with [10] who reported that the thrips population was recorded in the 34th SMW and 37th SMW during *Kharif*, 2003 when the temperature prevailed in range of 24.10 to 31.80 °C and relative humidity in the range of 70 to 91 per cent, which indicated that increase in maximum, minimum temperature, relative humidity, wind speed and rainfall, increased thrips population (4.60 thrips/plant). These findings are also in accordance with the findings of [5], who reported that thrips showed positive correlation to maximum (r=0.277) and minimum temperature (r=0.087). Thus, temperature had a major role on influence on thrips populations.

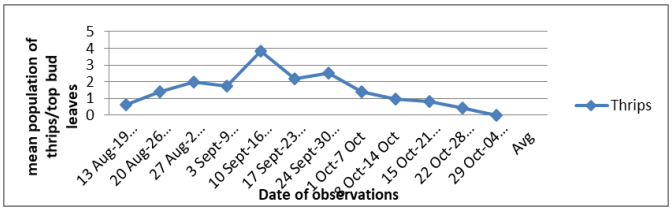
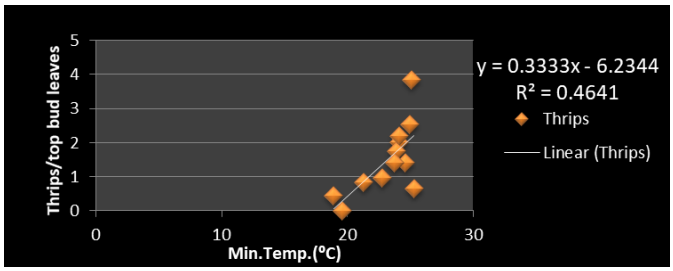


Fig 4: Mean population of thrips, *S. dorsalis* during *kharif* 2018



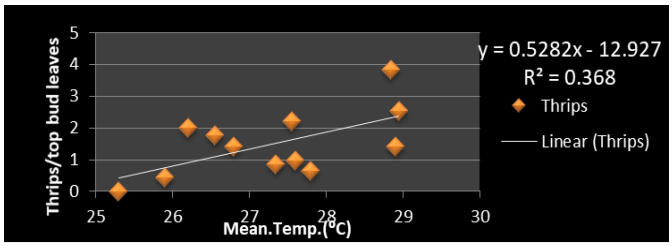


Fig 5: Regression equation between weather parameters and population buildup of thrips, *S. dorsalis*

Table 1: Seasonal incidence of major sucking insect pests infesting groundnut variety Jyoti during *kharif* 2018

SMW No.	Max. Temp. (ºC)	Min. Temp. (ºC)	Rain fall (mm)	RH (%) Mor.	RH (%) Eve.	Mean relative humidity (%)	Wind velocity (Kmph)	Sun shine (hours)	Average number of sucking insect pests		
									Aphids/ top 2 cm shoot	Leafhoppers/ top 3 leaves	Thrips/ top bud leaves
33	30.3	25.3	101.2	94	79	86.5	4.1	2.9	0.84	1.68	0.64
34	29.0	24.6	60.4	93	79	86	5.5	0.6	5.76	2.2	1.4
35	28.3	24.1	275.0	96	86	91	6.8	0.2	0	1.08	2
36	29.2	23.9	30.2	93	57	75	0.5	1.1	8.48	5	1.76
37	32.6	25.1	0.0	90	55	72.5	2.2	6.4	4.48	5.68	3.84
38	31.0	24.1	32.8	92	68	80	3.5	3.6	1.28	4.64	2.2
39	32.9	25.0	11.0	93	59	76	1.2	7.8	0.84	3.25	2.52
40	34.0	23.8	0.0	91	44	67.5	0.7	8.0	0	2.64	1.4
41	32.4	22.8	0.0	87	51	69	2.8	7.1	0	2.2	0.96
42	33.4	21.3	0.0	89	40	64.5	1.0	8.5	0	1.6	0.84
43	32.9	18.9	0.0	86	48	67	1.1	8.3	0	0.92	0.44
44	31.0	19.6	0.0	86	49	67.5	2.6	9.3	0	0	0

SMW: Standard Meteorological Week

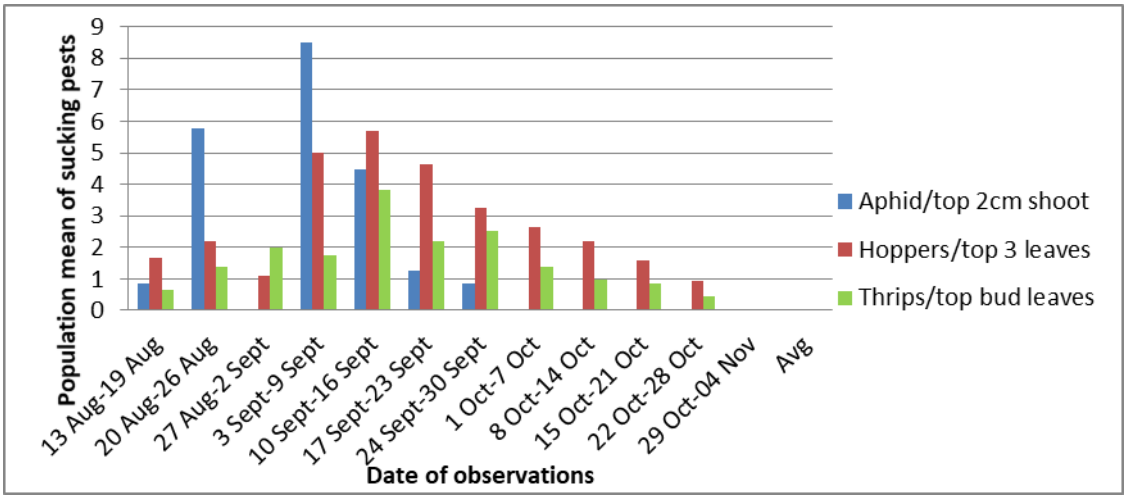


Fig 6: Seasonal fluctuation of sucking pests on groundnut crop during *kharif* 2018

4. Conclusion

It may be concluded from the present study that the peak population of sucking pests viz. aphid (8.48 / top 2 cm shoot), hoppers (5.68 / top 3 leaves) and thrips (3.84 / top bud leaves) were seen during 36th SMW, 37th SMW and 37th SMW, respectively. The correlation between the aphid population and weather parameters demonstrated a non-significant relationship. The correlation between the hoppers population and weather parameters revealed a significant positive relationship with minimum temperature (r= 0.610) and mean temperature (r = 0.575) (Fig 3) which indicated that increase in minimum and mean temperature, hoppers population will

be increased. The correlation between the thrips population and metereological parameters revealed a positive and significant association with minimum temperature (r= 0.681) and mean temperature (r= 0.606) (Fig 5) which indicated that increase in minimum and mean temperature, thrips population will be increased.

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