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Seasonal incidence of sucking insect pests of cowpea, *Vigna unguiculata* [Linn] Walpers in relation to abiotic factors

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Abstract
The present research was aimed to study the seasonal incidence pattern of aphid, jassid, whitefly, thrips in cowpea ecosystem during *kharif* season of the year 2015-2016. The result revealed that the incidence of aphid started from the second week of August (33 SMW) with a mean population of 9.6 aphids/ plant. The population increased gradually and attained its peak with a mean of 21.67 aphids/ plant during the second week of October (41 SMW). The infestation of jassids and whitefly commenced in the first week of August (32 SMW) with a mean population of 0.87 jassids/ plant and 0.60 whiteflies/ plant. The population increased gradually and touched its peak with a mean of 11.20 jassids/ plant and 5.87 whiteflies/plant during the third week of September (38SMW). The infestation of thrips started in the fourth week of August (35 SMW) with a mean population of 3.87 thrips/flower. The population increased gradually and recorded its peak with a mean of 5.20 thrips/flower during the second week of September (37 SMW). The aphid population showed negative significant correlation with rainfall. However the population of whitefly and jassid showed positive significant correlation with temperature and whitefly showed negative significant correlation with rainfall.

Keywords: Cowpea, aphid, jassid, whitefly, thrips, abiotic factors

Introduction
Cowpea, [*Vigna unguiculata* (Linn.) Wilczek; Leguminaceae] is one of the important pulse crops. It is also known as black eyed bean or Southern pea in English, while *chola* or *choli*, *chavli, lobia* in various vernacular languages in India. It is used as a vegetable, grain legume, fodder and as a green manure crop. The food legumes being the major source of protein have been grown by farmers for millennia providing nutritionally balanced food to the people of India [1]. The seeds of cowpea contain 23.4 per cent protein, 18 per cent fat, 60.3 per cent carbohydrate and are a rich source of lysine and tryptophan [2]. Like other legumes, cowpea has important beneficial effects in increasing soil fertility status because of their ability to fix atmospheric nitrogen.

As many as 21 insect pests of different groups have been recorded damaging cowpea from germination to maturity [3]. Among them aphid, *Aphis craccivora* Koch; jassid, *Empoasca fabae* (Harris)*;* thrips, *Megaleurothrips distalis* Karny; semilooper, *Thysanoplusia orichalcea* (Fab.); Leaf miner, *Phytomyza horticola* Meigen and pod borer, *Helicoverpa armigera* (Hubner) resulting in heavy yield losses [4, 5].

Considering all the above facts the present investigation is proposed to develop basic information on abundance and distribution of pest in relation to weather parameter as it help determining appropriate time of action and suitable effective method of control. Hence, an attempt has been made to study the seasonal incidence of major insect pests of cowpea.

Materials and methods
To study the seasonal incidence of major insect pests of cowpea was conducted at the agriculture research farm, institute of agricultural science Maharana pratap university agriculture and technology, Udaipur during *kharif* season 2015- 2016. Cowpea cultivar RC-101 was used for the study and the crop field was kept free from pesticide sprays. The peat activities starting from the first appearance of insect-pests to till they disappeared were watched.

Method of observation: Population of major insect pests *viz*. aphid *Aphis craccivora* (Koch), jassids *Empoasca Kerri* (pruthi), whiteflies *Bemisia tabaci* (gennadius), thrips, *Megaleurothrips distalis* karny; were recorded at weekly interval on five plants that were selected randomly and tagged as per techniques gives as under**:**

The aphid population was counted from 15 cm shoot tip of five randomly selected and tagged plants separately at weekly interval after upper, middle and lower portion gently shaking with the help of camel hair brush on a white paper sheet [6]. The jassid population was recorded by visual count on five randomly selected and tagged plants per plot at weekly intervals by gently turning the upper, middle and lower trifoliate and counted nymph and adults. Whitefly**:** The whitefly population was recorded on upper, middle and lower trifoliate by visual counting of five randomly selected and tagged plants per plot at weekly intervals. The thrips population was collected /dislocated from 10 randomly selected flower buds of five tagged plants at weekly interval with the help of camel hair brush by gently shaking on a white paper sheet placed in a petri dish and counted [6].

For this, the data were subjected to correlation and regression analysis with weather parameters *viz*., maximum and minimum temperatures, average relative humidity, sunshine hours and wind velocity in respect of the corresponding standard week. The meterological data for the above analysis were obtained from the meterological observatory of the university.

Statistical analysis

The correlation coefficient between the pest population and the abiotic factors of the environment using standard statistical formulae [7].

Results and Discussion

During 2015-16, the first incidence of aphids initiated in second week of August (33 SMW) with a mean population of 9.6 aphids/plant. The population increased gradually and attained its peak with a mean of 21.67 aphids/plant during second week of October (41 SMW) thereafter, pest population declined gradually and reached to a level of 11.00 aphids/plant in the last week of October (43 SMW). The pest showed positive correlation with temperature and negative significant correlation with rainfall. Present finding is in line with the finding of Gauns *et al.* (2014) [8] recorded that the cowpea aphid and jassid population in the middle of August that reached to its peak during 3rd week of October.

Similarly the infestation of jassids and whitefly commenced in the first week of August (32 SMW) with a mean population of 0.87 jassids/plant and 0.60 whiteflies/plant. The population increased gradually and touched its peak with a mean of 11.20 jassids/ plant and 5.87 whiteflies/plant during the third week of September (38SMW). The infestation of thrips started in the fourth week of August (35 SMW) with a mean population of 3.87 thrips/flower. The Jessid population reduced gradually and reached to a level of 1.20/plants in second week of October (41th SMW). The population of whitefly decline 0.87/plant in first week of October (40 SMW). The Jessid population showed positive significant correlation with temperature, While negative correlation with rainfall and humidity. The population of whitefly positive significant correlation with temperature and negative significant correlation with rainfall. These findings are in close agreement with Sarode *et al.* (2003) [9] observed that Jassids population was found to be significantly influenced by the minimum temperature and morning relative humidity (RH). They observed leaf hopper incidence during the second fortnight of August, peaked during the first fortnight of September (23.8 and 16.3 leaf hopper/top three leaves). Similarly the incidence of thrips *Megaleurothrips distalis* Karny commenced in the fourth week of august (35 SMW) with a mean population of 3.87 thrips/flower. The population attained its peak during second week of September with a mean of 5.20 thrips/flower. Thereafter the pest population reduced gradually being lowest in the second week of October (41 SMW). The thrips population positive correlation with temperature and relative humidity and negative correlation with rainfall. These findings are close agreement with Yadav and Singh (2006) [10] reported that maximum temperature had a significant positive effect on thrips population during the rainy season and the rainfall had an adverse affect on thrips population in greengram. In the present investigation it was found that positive correlation with temperature and relative humidity favour the multiplication of thrips.

Table 1: Effect of abiotic factors on the seasonal incidence of sucking pests on cowpea during *kharif*, 2016

S.M.W.	Date of months	Abiotic factors			Mean population per plant			
		Mean Temp. (^{0}C)	Mean R.H. (%)	Mean Rainfall (mm)	Aphids	Jassids	Whiteflies	Thrips
31	30-5 July	25.59	87.5	124.2	-	-	-	-
32	6-12 Aug	25.14	92	104.5	-	0.87	0.60	-
33	13-19 Aug	26.53	74.57	0.6	9.60	1.40	2.73	-
34	20-26 Aug	25.4	85	61.2	6.40	0.67	1.27	-
35	27-2 Sept	26.99	80.29	14.4	8.80	4.60	3.93	3.87
36	3-9 Sept	26.05	68.21	0	16.40	4.33	4.80	4.13
37	10-16 Sept	26.76	63.71	0	15.80	5.87	4.93	5.20
38	17-23 Sept	28.93	64.57	3.4	17.27	11.20	5.87	3.87
39	24-30 Sept.	28.67	58.36	0	14.40	4.20	3.13	2.13
40	1-7 Oct	27.47	76.79	62.4	7.47	0.60	0.87	2.33
41	8-14 Oct	25.74	76.5	0	21.67	1.20	1.80	1.60
42	15-21 Oct	25.17	51.21	0	20.47	1.00	0.40	1.67
43	22-28 Oct	23.26	54	0	11.00	-	-	-
Coefficient of correlation (r_1) for population and atm. temperature					.0308	0.915*	0.600*	0.201
Coefficient of correlation (r_2) for population and relative humidity					-0.518	- 0.437	-0.308	0.127
Coefficient of correlation (r_3) for population and total rainfall					-0.683*	-0.372	-0.581*	-0.169

*Significant at 5% level of significance, respectively

Conclusion

The population of aphid, jassid, whitefly and thrips recorded in cowpea crop through the growing season. The incidence of Jassid and whitefly were commenced in the first week of august and aphid commenced in second week of august. While the incidence of thrips population commenced in last week of august. The population of jassid and whitefly attained its peak during the third week of September. While aphid and thrips attained its peak during the second week of October and second week of September, respectively. The aphid, jassid, whitefly exhibited a positive correlation with temperature and negative correlation with relative humidity and rainfall. The thrips population showed positive correlation with temperature and relative humidity.

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