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Succession and incidence of insect fauna on green gram

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Abstract
The activity of aphid and whitefly was started from 34th SMW and continued till harvest of the crop with its peak population (21.9 and 7.5 insects/3compound leaves/plant, respectively) in 38th SMW. During present investigation the activity of jassid was started from 35th SMW and reached its peak (4.9 jassids/3 compound leaves/plant) in 40th SMW. The activity of coreid bug and flea beetle was started from 37th SMW with its peak population (2.6 and 3.5 insects/plant) in 40th SMW. Activity of Coccinellid beetle was started from 35th SMW and continued till harvest of the crop with its peak population (1.7 beetles/plant) in 38th SMW. During present investigation it was observed that the Coccinellid beetle population increased with an increase in aphid population. During present investigations significant positive correlation was observed in the population of all the insect fauna of green gram i.e. jassid, whitefly, flea beetle, coreid bud and coccinellid beetle with maximum temperature and evaporation. The positive correlation of aphid population was also observed with minimum temperature and evaporation.

Keywords: Coccinella, beetle, temperature

Introduction
Pulses, the food legumes have been grown by farmers since millennia providing nutritionally balanced food to the people of India and many other countries in the world (Nene, 2006) [1] and pulses are popularly known as "Poor man's meat" and "rich man's vegetable". India is major pulses growing country in the world and Madhya Pradesh is largest producer state. The total area and production in India under kharif pulses crop is 105.57 lakh ha and 58.44 lakh tones, respectively with the productivity of 554 kg^{-1} (Anonymous, 2017) [2]. The major pulse crops that have been domesticated and are under cultivation include kharif pulses like green gram, black gram, red gram, cow pea and Rabi pulses like lentil, chickpea, pea etc. Among the pulses Chickpea, Pigeon pea, Mungbean, Urdbean, Lentil and Field pea are the important crops which are widely cultivated at national and global level. The green gram is attacked by number of insect-pests viz. aphid, *Aphis craccivora* (Koch), jassid, *Empoasca kerri* (Pruthi), white fly, *Bemisia tabaci* (Gennadius), blister beetle, *Mylabris pustulata* (Thunberg) and pod borer *Helicoverpa armigera* (Hubner) (Jain 2014) [3].

Method and materials
The present studies were conducted at Research Farm, College of Agriculture, Gwalior during kharif season of 2018-19. Saket variety of green gram were sown on 9 August 2018 in a plot size of 9.0 m X 10.0 m with spacing of 30 cm X 10 cm. The observations on the insect fauna in each crop were recorded in the morning at weekly intervals starting from germination till the harvesting of the crop.Population of sucking insect pests (aphids, jassid, white fly, coreid bug,) were recorded by counting the number on three compound leaves i.e. top, middle and bottom portions/canopy of the randomly selected ten plants in each crop during early morning hours. Population of natural enemies (Coccinalid beetle) were also recorded by counting the number of adults present on ten randomly selected plants in each crop. Weekly data on Meteorological parameter, Viz. temperature, humidity, evaporation and rainfall were collected from the meteorological observatory of the college.

Results

The activity of aphid and whitefly was started from 34th SMW and continued till harvest of the crop with its peak population (21.9 and 7.5 insects/3compound leaves/plant, respectively) in 38th SMW. Bairwa and Singh (2017) [4] reported the peak population on aphid and whitefly in 36th and 35th SMW, respectively. Manju *et al*., (2016) [5] reported infestation of whitefly started from 2nd week of august (32th SMW) with its peak population on 3rd week of September (36th SMW). The variation in the time of peak population may be due to the climatic conditions of the region, stage of the crop and time of sowing. During present investigation the activity of jassid was started from 35th SMW and reached its peak (4.9 jassids/3 compound leaves/plant) in 40th SMW. Manju *et al*., (2016) [5] reported the infestation of jassid started from 2nd week of august (33rd SMW) and reached their peak in the first week of September (37th SMW).The activity of coreid bug and flea beetle was started from 37th SMW with its peak population (2.6 and 3.5 insects/plant) in 40th SMW. Activity of Coccinellid beetle was started from 35th SMW and continued till harvest of the crop with its peak population (1.7 beetles/plant) in 38th SMW. During present investigation it was observed that the Coccinellid beetle population increased with an increase in aphid population. Yadav *et al*., (2015) [6] reported, coccinellid beetles attained its peak population in 39th SMW. Choudhary *et al.*, (2017) [7] also reported the population of beetles increased with increase in aphid population which corroborate with present findings. During present investigations significant positive correlation was observed in the population of all the insect fauna of green gram i.e. jassid, whitefly, flea beetle, coreid bud and coccinellid beetle with maximum temperature and evaporation. Marabi *et al*., (2017) [8] reported significant positive correlation of whitefly population with maximum temperature and evaporation. Kumar *et al*., (2017) [9] reported, jassid population showed significant positive correlation with maximum temperature. Khan *et al*., (2018) [10] also reported flea beetle gradually increased with increase in average temperature. The positive correlation of aphid population was also observed with minimum temperature and evaporation. The positive correlation of aphid population was also observed with minimum temperature and evaporation. Beeraganni (2012) [11] reported the correlation of aphid found positive and significant with evaporation. There was no significant correlation among all the insect fauna with minimum temperature relative humidity and rainfall.

Table 1: Succession and incidence of insect fauna on Green Gram at different meteorological weekduring kharif- 2018-19

z	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)	Evaporation (mm)	Population of sucking insect pests on 3 compound leaves/plant			Insect fauna population/plant		
	Max.	Min.	Morn.	Even.			Aphid	Jassid	Whitefly	Flea beetle	Coreid bug	Coccinellid beetle
34	31.6	25.73	90.71	78.57	82.00	2.06	0.3	-	0.3	-	-	-
35	30.53	24.94	92.86	82.71	84.40	2.03	0.3	0.2	0.5	-	-	0.3
36	28.89	23.79	91.43	81.43	50.80	0.94	7.1	1.3	2.9	-	-	0.8
37	31.76	24.61	79.86	67.43	0.00	5.00	14.6	1.4	3.2	0.3	0.2	1.1
38	34.6	23.76	83.00	66.86	5.89	5.43	21.9	2.5	7.5	1.8	1.9	1.7
39	33.79	22.11	80.14	56.86	0.00	4.91	19.6	4.4	7.4	3.1	2.3	1.6
40	36.76	21.10	79.57	44.14	0.00	6.03	9.0	4.9	8.0	3.5	2.6	1.4
41	35.41	18.70	81.57	38.57	0.00	5.29	4.8	3.8	3.9	1.4	1.7	1.7
42	36.5	17.43	76.86	27.57	0.00	5.17	1.2	0.9	2.1	0.5	0.2	0.7
43	34.56	14.97	80.71	28.71	0.00	4.29	0.4	0.3	0.6	0.0	0.0	0.5

Table 2: Correlation coefficient of insect fauna on Green Gram

Abiotic factor	Aphid	Jassid	White fly	Flea beetle	Coreid bug	Coccinellid beetle
Coefficient of correlation (r) for population and atm. max. temperature	0.09	0.52*	0.45*	0.59*	0.59*	0.47*
Coefficient of correlation (r) for population and atm. min. temperature	0.32*	-0.1	0.09	-0.06	-0.06	-0.12
Coefficient of correlation (r) for population and relative humidity morning	-0.32	-0.48	-0.46	-0.46	-0.49	-0.55
Coefficient of correlation (r) for population and relative humidity evening	0.12	-0.28	-0.12	-0.25	-0.26	-0.27
Coefficient of correlation (r) for population and total rainfall	-0.47	-0.59	-0.57	-0.53	-0.52	-0.72
Coefficient of correlation (r) for population and total evaporation	0.44*	0.63*	0.63*	0.68*	0.66*	0.70*

Concussion

The study conducted at the Research Farm in Gwalior during the 2018-19 kharif season focused on insect fauna in green gram crops. Sucking insect pests, including aphids, jassids, whiteflies, and coreid bugs, were monitored weekly from germination to harvest. The study observed peak populations of aphids and whiteflies in the 38th SMW, jassids in the 40th SMW, and coreid bugs and flea beetles in the 40th SMW. Coccinellid beetles, natural predators, were also tracked, showing increased populations in response to aphids. A positive correlation between insect populations and meteorological factors, particularly temperature and evaporation, was noted.

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