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POPULATION DYNAMICS OF SUCKING PEST COMPLEX INFESTING GREENGRAM

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ABSTRACT

The investigations were carried out on succession of sucking pest complex infesting greengram during *Kharif* 2010 at Junagadh Agricultural University, Junagadh. During the study, jassid, *Empoasca kerri* Pruthi, whitefly, *Bemisia tabaci* (Gennadius) and thrips, *Megalurothrips distalis* (Karny) were the major sucking insect pests infesting the crop. Population dynamics of jassid, *E. kerri* revealed that the pest appeared during 2nd week after sowing and its population multiplied steadily in succeeding weeks and reached at a peak (5.20 nymphs/3 leaves) during 9th week after sowing. The whitefly, *B. tabaci* initiated its infestation from 2nd week after sowing with a population of 0.60 whitefly/3 leaves and peak with 5.40 whitefly/3 leaves at 9th week after sowing. Similarly, Thrips, *M. distalis* infestation was started from 2nd week after sowing with the population of 0.40 thrips/3 leaves and increased gradually to attain a peak (4.20 thrips/3 leaves) during 10th week after sowing.

Key words: Population dynamics, sucking pest, greengram.

INTRODUCTION

Greengram (*Vigna radiata* (L.) Wilczek) is locally known as moong and belongs to family Leguminaceae. Greengram is known to be native to India and Central Asia. The crop is mainly grown for its grains which are consumed either whole or in split form (*dal*). Its nutritive value is due to its high protein content, varying from 23.4 to 33 per cent (Mehta, 1970).

Around the world, the crop is cultivated on 5.0 million hectares with production of 2.5 million tonnes. While, in India it is grown on 30.41 lakh hectares with production and productivity of 11.73 lakh tonnes and 389 kg/ha, respectively. Gujarat covers an area of about 1.62 lakh hectares with production of 0.7 lakh tonns with average productivity of 432 kg/ha (Anon., 2009).Such an important pulse crop suffers from the attack of number of insect pests causing the loss of about 73.86 per cent (Pandey *et al*., 1991). Lal and Sachan (1987) reported major insect pests damaging the crop.

Among the sucking insect pests, jassid, thrips and whitefly are the major pests limiting profitable cultivation of greengram in Gujarat State. The whitefly, (*B. tabaci*) is one of the important sucking pests and causes heavy economic loss not only through direct loss of plant vitality due to its feeding on the cell sap, but also by transmitting the yellow mosaic virus disease. This pest causes yield loss from 25 to 78 per cent (Sharma and Verma, 1984). The thrips, *M. distalis* damages the crop at floral stage and causes flower deformity, which may ultimately result in total failure of the crop.

MATERIALS AND METHODS

The succession study of sucking pest complex was carried out on greengram variety GM-4 during *Kharif,* 2010. The crop was grown in a plot size of 10.0 m x 10.0 m at the spacing of 45 cm x 10 cm. Ten quadrates each of 1.0 m x 1.0 m were made in crop area from which 5 plants were randomly selected and tagged. Populations of sucking pests were observed from the tagged 5 plants at weekly intervals from appearance of the pests till its harvest.

The observations on jassid, whitefly and thrips were recorded early in the morning at weekly interval. Three trifoliate leaves (upper, middle and lower) of each plant were observed for recording the pest population. Nymphs were observed in case of jassid, while adult counts were made for whitefly and thrips population. Mean pest population was worked out and the data were correlated with weather parameters.

The meteorological parameters were used for computing simple correlations between the pests and the weather parameters (atmospheric temperatures, relative humidity and sunshine). The following formula was used for calculating correlation coefficient.

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

Where,

r_{xy} = Simple correlation coefficient

X = Variable i.e. abiotic component. (Average temperature and relative humidity)

Y = Variable i.e. mean number of insect pests

n = Number of paired observations

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

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

RESULTS AND DISCUSSION

Succession of sucking pest complex infesting greengram

1 Jassid, *E. kerri*

The data presented in Tables (1) & (2) reveal that the infestation commenced in second week after sowing (27th standard week) with 0.50 jassid nymph/3 leaves. After commencement, the jassid population increased steadily during each succeeding week i.e. third to eighth week after sowing (2nd to 3rd standard week) and recorded 0.90 to 3.60 nymphs/3 leaves during this period. The jassid population was recorded at the peak level in ninth week after sowing (34th standard week) with 5.20 nymphs/3 leaves. Maximum temperature had significant negative correlation with the jassid population (r = –0.55).

Earlier, Patel (1997) found significant positive correlation between the incidence of *E. kerri* on cowpea and relative humidity. Virani and Butani (2003) observed that jassid on blackgram had significant positive correlation with relative humidity whereas significant negative correlation

Table 1. Population of jassid, *Empoasca kerri* Pruthi on greengram during *Kharif* 2010

Std. week	WAS	Jassid nymphs/ 3 leaves/ plant	Temperature (°C)		Relative humidity (%)		Sunshine (hr)	Rainfall (mm)
			Max.	Min.	Morning	Evening		
26	1	0.00	36.7	27.0	84.7	52.0	4.1	59.0
27	2	0.50	31.3	26.2	88.7	79.0	1.2	97.9
28	3	0.90	31.7	25.5	93.0	84.6	1.9	126.9
29	4	1.20	31.3	25.3	94.4	84.7	0.8	53.3
30	5	1.40	29.2	24.7	96.1	82.3	1.3	113.1
31	6	1.70	29.6	24.5	96.4	88.9	1.2	198.4
32	7	2.50	29.6	24.8	94.9	85.7	1.1	80.6
33	8	3.60	30.8	25.3	91.0	77.9	1.5	61.8
34	9	5.20	31.4	25.2	91.6	76.6	3.0	15.1
35	10	4.20	30.1	24.2	94.6	92.4	0.8	244.6
36	11	3.40	29.4	24.7	95.9	88.7	0.4	117.2
37	12	2.70	29.5	24.4	95.0	80.6	0.1	72.2
38	13	2.20	33.4	23.0	87.7	58.1	8.1	4.8
39	14	1.30	34.1	22.7	84.9	63.3	7.9	46.2
40	15	0.00	36.5	22.3	80.1	36.9	9.1	0.0

WAS = Week after sowing, Max. = Maximum, Min. = Minimum

Table 2. Correlation of weather parameters with population of jassid, *Empoasca kerri* Pruthi on greengram during *Kharif* 2010

Insect pest	Temperature (°C)		Relative humidity (%)		Sunshine hr.	Rainfall (mm)
	Max.	Min.	Morning	Evening		
Jassid	-0.5532*	-0.0350	0.4911	0.4985	-0.3548	0.1810

*Significant at 5 per cent level (r=0.514)
Number of observations (weeks): 15

with the maximum temperature. Thus, the present findings are more or less in agreement with the result reported by earlier workers.

2 Whitefly, *B. tabaci*

The data presented in Tables (3) & (4) reveal that the whitefly, *B. tabaci* population was recorded maximum i.e. 5.40 whiteflies/3 leaves during ninth week after sowing (34th standard week); while the population appeared from second week after sowing (27th standard week) and gradually increased upto third to eighth week after sowing i.e. 0.90 to 3.50 adult/3 leaves. After ninth week of sowing, it decreased steadily upto maturity stage i.e. 5.40 to 1.40 adult/ leaves; whereas, it disappeared 15 weeks after sowing, when crop was mature at Junagadh condition during *Kharif* 2010.

The relative humidity (evening) exhibited a significant positive correlation with the pest population; while, maximum temperature exhibited significant negative correlation with the pest population (r = –0.567).

According to Jayanthi *et al*. (1993), population of whitefly on groundnut was positively correlated with rainfall and evening relative humidity but negatively correlated with sunshine hours. Virani (2000) found that whitefly on black gram had a significant negative correlation with minimum temperature. Hence, the present findings are similar to the results of earlier workers.

3. Thrips, *M. distalis*

The data presented in Tables (5) & (6) show that infestation of thrips, *M. distalis* (0.40 thrips/3 leaves) commenced from second week after sowing (27th standard week). The pest population increased constantly during third to ninth week after sowing (28th to 34th standard week) with the population of 0.80 to 2.80 thrips/ 3 leaves. The pest population reached to a peak with 4.20 thrips/3 leaves

Table 3. Population of whitefly, *Bemisia tabaci* (Gennadius) on greengram during *Kharif* 2010

Std. week	WAS	Jassid nymphs/ 3 leaves/ plant	Temperature (°C)		Relative humidity (%)		Sunshine (hr)	Rainfall (mm)
			Max.	Min.	Morning	Evening		
26	1	0.00	36.7	27.0	84.7	52.0	4.1	59.0
27	2	0.60	31.3	26.2	88.7	79.0	1.2	97.9
28	3	0.90	31.7	25.5	93.0	84.6	1.9	126.9
29	4	1.30	31.3	25.3	94.4	84.7	0.8	53.3
30	5	1.60	29.2	24.7	96.1	82.3	1.3	113.1
31	6	1.90	29.6	24.5	96.4	88.9	1.2	198.4
32	7	2.70	29.6	24.8	94.9	85.7	1.1	80.6
33	8	3.50	30.8	25.3	91.0	77.9	1.5	61.8
34	9	5.40	31.4	25.2	91.6	76.6	3.0	15.1
35	10	4.60	30.1	24.2	94.6	92.4	0.8	244.6
36	11	3.50	29.4	24.7	95.9	88.7	0.4	117.2
37	12	2.60	29.5	24.4	95.0	80.6	0.1	72.2
38	13	2.20	33.4	23.0	87.7	58.1	8.1	4.8
39	14	1.40	34.1	22.7	84.9	63.3	7.9	46.2
40	15	0.00	36.5	22.3	80.1	36.9	9.1	0.0

WAS = Week after sowing, Max. = Maximum, Min. = Minimum

Table 4. Correlation of weather parameters with population of whitefly, *Bemisia tabaci* (Gennadius) on greengram during *Kharif* 2010

Insect pest	Temperature (°C)		Relative humidity (%)		Sunshine hr.	Rainfall (mm)
	Max.	Min.	Morning	Evening		
Whitefly	-0.5669*	-0.0366	0.5084	0.5218*	-0.3651	0.2260

*Significant at 5 per cent level (r=0.514)
Number of observations (weeks): 15

Table 5. Population of thrips, *Megalurothrips distalis* (Karny) on greengram during *Kharif* 2010

Std. week	WAS	Jassid nymphs/ 3 leaves/ plant	Temperature (^{0}C)		Relative humidity (%)		Sunshine (hr)	Rainfall (mm)
			Max.	Min.	Morning	Evening		
26	1	0.00	36.7	27.0	84.7	52.0	4.1	59.0
27	2	0.40	31.3	26.2	88.7	79.0	1.2	97.9
28	3	0.80	31.7	25.5	93.0	84.6	1.9	126.9
29	4	1.00	31.3	25.3	94.4	84.7	0.8	53.3
30	5	1.20	29.2	24.7	96.1	82.3	1.3	113.1
31	6	1.80	29.6	24.5	96.4	88.9	1.2	198.4
32	7	2.00	29.6	24.8	94.9	85.7	1.1	80.6
33	8	2.40	30.8	25.3	91.0	77.9	1.5	61.8
34	9	2.80	31.4	25.2	91.6	76.6	3.0	15.1
35	10	4.20	30.1	24.2	94.6	92.4	0.8	244.6
36	11	3.60	29.4	24.7	95.9	88.7	0.4	117.2
37	12	3.20	29.5	24.4	95.0	80.6	0.1	72.2
38	13	2.20	33.4	23.0	87.7	58.1	8.1	4.8
39	14	1.20	34.1	22.7	84.9	63.3	7.9	46.2
40	15	0.00	36.5	22.3	80.1	36.9	9.1	0.0

WAS = Week after sowing, Max. = Maximum, Min. = Minimum

Table 6. Correlation of weather parameters with population of thrips, *Megalurothrips distalis* (Karny) on greengram during *Kharif* 2010

Insect pest	Temperature (^{o}C)		Relative humidity (%)		Sunshine hr.	Rainfall (mm)
	Max.	Min.	Morning	Evening		
Thrips	-0.6346*	-0.1509	0.5891*	0.5699*	-0.4151	0.3898

*Significant at 5 per cent level (r=0.514)

during 10th week after sowing (35th standard week). A significant positive correlation of the pest population was observed with relative humidity (morning and evening) (r = 0.589, r = 0.569); whereas, significant negative correlation of the pest population was found with the maximum temperature (r = –0.634).

According to Yadav and Singh (2006), the cumulative effect of environmental factors on thrips was more pronounced with marked effect of maximum temperature. Dabhade (2009) observed that the thrips on groundnut exhibited significant positive correlation with morning relative humidity and significant negative correlation with maximum temperature. Thus, the present findings conform with the earlier findings.

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