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RESEARCH ARTICLE

Population dynamics of insect pests of green gram [*Vigna radiata* (Linn.) Wilczek] in semi-arid region of Rajasthan

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ABSTRACT

Three insect pest species, *viz.,* jassid, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* (Genn.) and thrips, *Caliothrips indicus* Bagnall appeared as major insect pests of green gram, *Vigna radiata* (Linn.) Wilczek in the semi-arid region of Rajasthan. The population commenced from first week of August and remained throughout the crop season in both the years (*Kharif*, 2006 and 2007). The infestation gradually reached at peak (12.40 jassids, 10.80 whiteflies and 9.40 thrips/ three leaves during *Kharif* 2006 and 13.2 jassids, 11.20 whiteflies and 9.87 thrips/ three leaves during *Kharif,* 2007) in the first week of September during both the years. Among natural enemies, the populations of *Chrysoperla carnea* (Steph.) and *Coccinella septempunctata* L. were high, whereas, *Monomorium indicum* (Linn.), *Menochilus sexmaculatus* (Fab.) and *Brumus suturalis* Fab. were low. The correlation co-efficient (r) of jassid, whitefly and thrips populations was worked out with weather parameters, *viz.*, maximum and minimum temperature and relative humidity. The data indicated a significant negative correlation of jassid, whitefly and thrips with maximum temperature (r=-0.61, -0.56 and-0.54 in 2006 and -0.65, -0.78 and -0.52 in 2007, respectively) and positive significant correlation of thrips with minimum temperature (r=0.67 in 2006 and 0.56 in 2007, respectively). The data indicated a positive significant correlation of jassid, whitefly and thrips with relative humidity (r=0.62, 0.63 and 0.68 in 2006 and 0.70, 0.56 and 0.72 in 2007, respectively).

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INTRODUCTION

Green gram (Synonyms: golden bean or mung bean), *Vigna radiata* (Linn.) Wilczek (Family: Leguminosae, Sub-family: Papilionaceae) is the pulse crop being grown from antiquity and important Asiatic *Vigna.* India is the largest producer, importer and consumer of pulses in the world, accounting 25 per cent of the global production, 15 per cent trade and 27 per cent consumption as sizeable population in the country still depends on vegetarian diet to meet its protein requirement. Rajasthan is a major grower of the pulses in general and green gram in particular. In Rajasthan, the total area under pulses was 20, 28,329 hectares with the annual production of 5, 02,521 tonnes, whereas, the total area under green gram was 7, 50,847 hectares with the total production of 2, 71,112 tonnes (Anonymous, 2007). A meagre amount of work has been done on seasonal incidence of the insect pests and their predatory fauna associated with this crop. The effect of abiotic factors on the incidence of insect pests provide suitable know how about the congenial weather conditions for development of insect pests, thus immensely helpful in formulating the management strategy against them.

MATERIALS AND METHODS

The present investigation was carried out at the Agronomy farm of S.K.N. College of Agriculture, Jobner, during *Kharif*, 2006 and 2007 to monitor the insect pests on green gram, [*Vigna radiata* (Linn.) Wilczek]. The variety RMG-62 was sown on normal date of sowing, *i.e.,* 8th July during

both the years (*Kharif*, 2006 and 2007) in five plots of 3.3 x 2.7 m^2, keeping row to row and plant to plant distance of 30 and 10 cm, respectively. All the recommended agronomical practices were adopted to raise the crop in the experimental field. For recording the observations, the crop was left for having the natural infestation. The observations on insect pest population and natural enemies were recorded from five tagged plants at weekly interval from the appearance of insect pests till harvesting of the crop. The data recorded on insect pests and meteorological parameters were used for statistical analysis. To interpret the results of seasonal incidence of insect pests of green gram, simple correlation was computed between pest population and abiotic factors, *i.e.,* the minimum and maximum temperature and relative humidity. The results obtained have been presented below:

RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

Quantitative and qualitative status of insect pests and their natural enemies :

From the observations made during the crop season (*Kharif*, 2006 and 2007), it was observed that insect species belonging to different taxonomic orders appeared at different stages of crop growth. Among these, jassid, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* (Genn.) and thrips *Caliothris indicus* Bagnall were found to be the major insect pests attacking the crop (Table 1 and 2). The aphid, *Aphis craccivora* Koch.; semi-lopper, *Plusia orichalaca* (Fab.), green bug, *Nezara viridula* L.; whitegrub, *Holotrichia consanguinea*

Table 1: Effect of abiotic factors on the population of jassid, whitefly and thrips during *Kharif*, 2006

Date of observation	SMW*	Mean jassid population/ 3 leaves	Mean whitefly population / 3 leaves	Mean thrips population / 3 leaves	Mean *Coccinella septempunctata* / 10 plants	Mean *Chrysoperla carnea* / 10 plants	Meteorological parameters		
							Temperature (ºC)		Relative humidity (%)
							Maximum	Maximum	
05/8/2006	32	2.20	3.07	1.80	0.00	0.00	37.8	22.4	71.5
12/8/2006	33	3.93	4.00	2.40	0.90	0.80	38.3	21.2	71
19/8/2006	34	7.47	4.93	4.80	1.60	0.90	34.2	24.6	79
26/8/2006	35	10.07	9.40	7.73	2.20	3.60	32.3	25.8	81
02/9/2006	36	12.40	10.80	9.40	2.70	2.90	31.7	22.9	76
09/9/2006	37	8.80	7.07	5.20	1.90	4.10	34.1	22.3	67.5
16/9/2006	38	6.47	5.80	4.07	2.00	3.40	32.2	21.4	69
23/9/2006	39	2.80	2.60	1.00	1.00	2.30	32.2	19.8	56.5
Correlation co-efficient with mean jassid population (r)							-0.61*	NS	0.62*
Correlation co-efficient with mean whitefly population (r)							-0.56*	NS	0.63*
Correlation co-efficient with mean thrips population (r)							-0.54*	0.67*	0.68*

* Indicate significance of value at P=0.05

Table 2: Effect of abiotic factors on the population of jassid, whitefly and thrips during *Kharif*, 2007

Date of Observation	SMW*	Mean jassid population/ 3 leaves	Mean whitefly population / 3 leaves	Mean thrips population / 3 leaves	Mean *Coccinella septempunctata* / 10 plants	Mean *Chrysoperla carnea* / 10 plants	Meteorological parameters		
							Temperature (ºC)		Relative humidity (%)
							Maximum	Maximum	
08/8/2007	32	2.93	2.47	1.2	0.00	0.00	35.5	23.3	70.5
15/8/2007	33	4.8	3.2	2.87	1.00	0.00	38.9	23.2	63
22/8/2007	34	6.4	5.2	4.47	1.80	1.00	37.2	25	76
29/8/2007	35	10.6	9.8	6.4	2.00	3.30	30.2	23.6	85.5
05/9/2007	36	13.2	11	9.87	2.30	3.10	32.3	24.3	78.5
12/9/2007	37	9.07	11.2	5.27	1.60	4.30	32.1	22.5	69.5
19/9/2007	38	7.8	8.2	3.53	2.00	3.60	33.2	21.3	65
26/9/2007	39	2.47	3.13	1.07	1.00	2.40	34.2	19.6	59.5
Correlation co-efficient with mean jassid population (r)							-0.65*	NS	0.70*
Correlation co-efficient with mean whitefly population (r)							-0.78*	NS	0.56*
Correlation co-efficient with mean thrips population (r)							-0.52*	0.56*	0.72*

* Indicate significance of value at P=0.05

Blanch.; termite, *Odontotermes obesus* (Rambur); galerucid beetle, *Madursia obscurella* Jac; stem fly, *Ophiomyia phaseoli* (Tryon.); horned caterpillar, *Herse convolvuli* L. and blister beetle, *Mylabris pustulatus* These were found attacking the crop at different stages and in traces so their population could not be recorded in present study. Therefore, these insect pests were categorized as minor pests. These findings corroborates with the observations made by Sahoo and Patnaik (1994), Borah (1995), Devesthali and Saran (1998) and Dar *et al*. (2002).

Some species of natural enemies recorded from the experimental field were *Chrysoperla carnea* (Steph.); *Coccinella septempunctata* Linn.; *Menochilus sexmaculatus* (Fab.); *Brumus suturalis* (Fab.); and black ant, *Monomorium indicum* (Linn.). The populations of *C. carnea* and *C. septempunctata* were abundant, whereas, others were negligible. These findings are in full conformity with the results of Manjunatha *et. al*. (1988) and Sardana and Verma (1986).

Effect of abiotic factors on the incidence of insect pests of green gram :

With the view to provide a sound base for the management of insect pest, a quantitative estimation of population build up was carried out in relation to abiotic factors, *viz.,* minimum and maximum temperature and relative humidity under the prevailing agro-climatic conditions of the locality.

The infestation of insect pests started in the first week of August and increased gradually and reached at peak (12.40 jassids, 10.80 whiteflies, and 9.40 thrips/ three leaves during *Kharif* 2006 and 13.2 jassids, 11.20 whiteflies and 9.87 thrips/ three leaves during *Kharif,* 2007) in the first week of September during both years of study (Table 1and 2). These findings partially corroborate with the observations of Kumar *et al*. (2004) who found highest population of whitefly in second fortnight of September when the maximum and minimum temperature and relative humidity were 32.5 ^{o}C, 20.8 ^{o}C and 82.00 per cent, respectively. The infestation of insect pests of *V. radiata* started at 32nd standard meteorological week during both the years of study with significant negative correlation of insect pests (*i.e*., jassids, whitefly and thrips) with maximum and significant positive correlation of thrips with minimum temperature and significant positive correlation between insect pests (*i.e.,* jassids, whitefly and thrips) and relative humidity during both years of study. These results are in partial agreement with those of Singh *et al*. (1990) who conducted field experiment to determine the effect of temperature, relative humidity, rainfall, wind spread on population build of the *Empoasca kerri* and *C. indicus*. These environmental factors affected the abundance of both insect pests.The thrips, whiteflies and jassids appeared in 35th meteorological week, *i.e.,* from 27th August to 2nd September and remained active till harvest of the crop. The peak period of activity of thrips and whiteflies was recorded in the 40th meteorological week, whereas, maximum population of jassids was observed in the 39th meteorological week (Anonymous, 1999).

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