



## POPULATION DYNAMICS OF THE FENUGREEK APHID, *ACYRTHOSIPHON PISUM* (HARRIS)

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### ABSTRACT

A field experiment was carried out to study the population dynamics of fenugreek aphid on variety RMt-1 during *rabi*, 2011-12. The incidence of the pest began from the 2<sup>nd</sup> standard meteorological week (SMW) in January and continued up to 13<sup>th</sup> SMW in March with a peak activity (105.10 aphids/10cm top shoot) during 7<sup>th</sup> SMW in February, 2012. The two aphid predators, *C. septempunctata* and *Chrysoperla* sp. were observed feeding on the aphid. The population of both the predators was the minimum in the 3<sup>rd</sup> SMW and maximum in the 7<sup>th</sup> SMW, being 4.50 and 2.90 per 10cm top shoot/plant, respectively. The coefficient of correlation (r) between the aphid and both the predators (*C. septempunctata* and *Chrysoperla* sp.) revealed significant positive correlation 0.957 and 0.941, respectively.

**Key words:** Population dynamics, fenugreek aphid, aphidophagous predators

### INTRODUCTION

Fenugreek (*Trigonella foenum graecum* Linn.) commonly known as *Methi* (Family: Fabaceae) is an important seed spice crop cultivated mainly in North India. The green plant in its tender or succulent stage is used as a vegetable, in dough stage as fodder for cattle, while the seeds are used mainly as condiment and for medicinal purposes. In India, Rajasthan, Madhya Pradesh, Gujarat, Uttar Pradesh, Maharashtra and Punjab are the leading states in fenugreek production. Fenugreek is infested by the aphids, *Acyrtosiphon pisum* (Harris), *Aphis craccivora* Koch; whitefly, *Bemisia tabaci* (Genn.); lentil pod borer, *Etiella zinckenella* Treit; bean fly, *Ophiomyia phaseoli* (Tryon); tobacco caterpillar, *Spodoptera litura* Fab.; surface grasshopper, *Chrotogonus trachypterus* Blanch and *Thrips tabaci* Lindemann (Manohar, 1988 and Kumawat and Dadhich, 1993). Among these insect pests, the pea aphid (*A. pisum*) causes significant losses by sucking the cell sap from the succulent plant parts reducing the vitality and yield potential; besides, it secretes honey dew that provides suitable media for development of sooty mould that ultimately hampers the process of photosynthesis (Joshi and Mathur, 1967). Sharma (1989) reported that pea aphid also acts as a vector of several viruses responsible for causing diseases like clover yellow vein, alfalfa mosaic, pea venation mosaic, pear leaf roll, maize dwarf and citrus tristeza. The pea aphid has a wide host range and infests fenugreek, pea, alfalfa, bean and several wild plants (James, 1973). The avoidable losses due to *A. pisum* on fenugreek were reported to be 37.82

per cent (Singh, 1996) and 40.15 per cent (Yadav, 2004). It is necessary to have basic information on population dynamics of pest species that enables one to know the potential natural mortality factors that can be exploited for better management of the pest. The key biotic and abiotic factors of the environment play an important role in population fluctuation of insects; thus, the present study was undertaken to study the population dynamics of the fenugreek aphid in the semi-arid region of Rajasthan.

### MATERIALS AND METHODS

With a view to study the effect of biotic and abiotic factors on the population of *A. pisum* on fenugreek, variety RMt-1 was sown in the first fortnight of November at the Agronomy Farm, College of Agriculture (S. K. Rajasthan Agricultural University, Bikaner) during *rabi*, 2011-12 in plots of 100m<sup>2</sup> (10m x 10m). The row to row and plant to plant spacing was maintained at 30cm and 10cm, respectively. Five plants selected at random were tagged in each plot to record the aphid population from the top 10cm of central shoot. Observations were taken during early hours of the day at weekly intervals from aphid appearance on the crop until maturity. Weekly observations for natural enemies were also recorded on the same 5 randomly selected plants in each plot. Simple correlation was worked out between aphid population and the biotic and abiotic environmental factors of the prevailing environment (Agarwal, 2011).

## RESULT AND DISCUSSION

The population fluctuation of the fenugreek aphid (*A. pisum*) recorded during the crop season 2011-12 on variety RMt-1 has been presented in Table (1). The data reveal that the aphid population commenced in the 2<sup>nd</sup> SMW of January, 2012. Initially, population of aphid was low (5.02 aphids/ central shoot) that gradually increased and reached to its peak period in 7<sup>th</sup> SMW (105.10 aphids/ central shoot). A gradual decline in the pest population was evident thereafter. The temperature was lowest in the 2<sup>nd</sup> SMW of January (11.6 °C) and highest in the 13<sup>th</sup> SMW of April (27.95 °C). The mean relative humidity during the crop season was in the range of 26.5 to 54.5 per cent, the lowest in the 12<sup>th</sup> SMW of March and highest in the 2<sup>nd</sup> SMW of January. The highest aphid population (105.10 aphids/ central shoot) was observed at 14.65°C temperature and 43.5 per cent relative humidity. Earlier, Deshwal (2007) reported that the incidence of *A. pisum* started in 2<sup>nd</sup> standard meteorological week in 2002-03 and 2003-04. The population increased gradually and reached its peak in sixth standard meteorological week during 2002-03 (103.25 aphids/ five plants) and during seventh standard meteorological week during 2003-04 (96.50 aphids per five plants); thereafter, the population declined gradually and completely disappeared after 11<sup>th</sup> SMW. Meena and Bhargava (2001) observed maximum population of aphid (*A. pisum*) on fenugreek in the first week of February when average temperature ranged between 20-25°C coupled with a relative humidity of 57.5 per cent. Joshi and Mathur (1967), Kumar (1976), Lal (1976) and Manohar (1988) reported *A. pisum* infestation on fenugreek from December to March with peak activity in February. The slight variation in results might be due to

the local variation in meteorological parameters and crop condition.

The lady bird beetle, *Coccinella septempunctata* was observed predated the aphid (*A. pisum*) in the experimental field of fenugreek; the populations of this predator were in the range of 0.31 to 4.50 per 10 plants, minimum being in the 3<sup>rd</sup> SMW of January and maximum in the 7<sup>th</sup> SMW of February, 2012 and a gradual decline was observed thereafter. The peak population of the predator was recorded to be 4.50 individuals/ 10 plants in 7<sup>th</sup> SMW of February, 2012 when the pest aphid population was also the maximum. The green lacewing, *Chrysoperla* sp., was also observed to feed on the aphid, *A. pisum*; the population of this predator was in the range of 0.10 to 2.90 per 10 plants, minimum being in 3<sup>rd</sup> SMW of January and maximum in 7<sup>th</sup> SMW of February, a gradual decline was observed thereafter. The peak population of the predator was recorded to be 2.90 individuals per 10 plants on 7<sup>th</sup> SMW of February, when the pest population was also maximum, indicating a density-dependent association (Table 1).

With the view to provide a sound base of management of aphid, *A. pisum*; quantitative estimation of population dynamics was carried out in relation to abiotic factors of environment, viz., temperature and relative humidity under the prevailing set of agro-climatic conditions. As evident from Table (2), the coefficient of correlation (r) revealed a non-significant correlation of the aphid population with mean temperature (-0.326) and relative humidity (-0.044). Meena and Bhargava (2001) reported a significant positive correlation of fenugreek aphid population with relative humidity.

**Table 1: Population dynamics of the fenugreek aphid during rabi, 2011-12**

SMW	Mean abiotic factors of environment		Mean population (No./5 plants)		
	Mean Temperature (°C)	Mean Relative Humidity (%)	<i>A. pisum</i>	<i>C. septumpunctata</i>	<i>Chrysoperla</i> sp.
2	11.6	54.5	5.02	0.00	0.0
3	13.55	54	11.00	0.31	0.10
4	13.65	49	24.50	1.10	0.33
5	14.3	45.5	45.60	2.10	1.20
6	12.85	44	82.25	3.40	2.00
7	14.65	43.5	105.10	4.50	2.90
8	16.7	38	77.50	3.10	2.40
9	20.3	36.5	64.00	2.80	2.00
10	21.05	31	43.50	2.30	1.60
11	22.8	32.5	19.75	2.00	1.00
12	24.25	26.5	10.01	1.09	0.95
13	27.95	36.5	5.00	0.85	0.47

**Table 2. Correlation coefficient between aphid, its natural enemies as well as abiotic factors**

Pest	Natural enemies		Mean abiotic factors		
	<i>A. pisum</i>	<i>C. septempunctata</i>	<i>Chrysoperla</i> sp.	Temperature ( <sup>o</sup> C)	Relative Humidity (%)
		0.957*	0.941*	-0.326	-0.044

\*Significant at 1% level of significance

The correlation between aphid population and ladybird beetle, *C. septempunctata* revealed (Table 2) significant positive correlation ( $r = 0.957$ ) at 1 per cent level of significance. Likewise, the coefficient of correlation between aphid population and *Chrysoperla* sp. was significantly positive ( $r = 0.941$ ) at 1 per cent level of significance. It showed that as soon as the population of aphid increased, the population of ladybird beetles also increased that also suggests that with the availability of prey food their population increased depicting a density-dependent action. Yadav (2004) observed *C. septempunctata* and *M. sexmaculatus* to be potential predators of *A. pisum* on fenugreek.

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