

Population dynamics of *Aphis gossypii* Glover on coriander in relation to biotic and abiotic factors

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ABSTRACT

Field experiment was conducted on population dynamics of *Aphis gossypii* Glover on coriander (Gujarat coriander 2) in relation to biotic and abiotic factors during winter season of 2011-12 and 2012-13. Incidence of aphid on coriander started from 3rd week of December (51st SMW) and continued till 1st week of March (10th SMW) with a peak level during 5th week of January (5th SMW). Minimum and mean temperature had highly significant negative association with aphid incidence during first year, whereas non-significant negative correlation with the pest activity during second year. The morning vapour pressure had significant negative relationship with *A. gossypii* during first year and non-significant negative association during second year. Remaining all the tested meteorological parameters showed non-significant relationship with aphid population on coriander crop during both the years. The biotic factors, viz., coccinellids and syrphids as well as their cumulative numbers showed highly significant positive correlation with aphid population during both the years.

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INTRODUCTION

Aphis gossypii Glover is a prolific breeder and its population increases very rapidly under favourable weather conditions. Abiotic factors play a vital role in aphid population build up. Aphidophagous predators like coccinellids and syrphids are considered as important factors in managing the aphid population. With the study of environmental factors and population build up, behaviour model can be developed which will help in formulating a suitable and ecologically sound IPM (Singh

and Rai, 1994). Keeping these points in view, the present investigation was carried out to study the relationship between aphid population and biotic as well as abiotic factors in coriander crop.

MATERIAL AND METHODS

The field experiment on activity of *A. gossypii* on coriander was carried out at Anand Agricultural University, Anand during *Rabi*, 2011-12 and 2012-13. The coriander (Gujarat Coriander 2) crop was grown

during 1st week of November in an area of 15 x 10 m at 30 x 15 cm spacing in both the years by following the recommended agronomical practices. The coriander crop under experiment was kept free from application of any insecticide. For recording the observations, coriander plots were divided into 6 equal sectors. From each sector, 5 plants were selected randomly and tagged with label for recording the observations. On each selected plant, 3 branches were randomly selected and aphid was counted from 5 cm shoot of each branch at weekly interval starting from one week after germination till harvest of the crop. Observations on coccinellids (adult + grub) and syrphid larvae were also recorded from the whole tagged plants. Data, thus, obtained were correlated with biotic and abiotic factors to determine effect on fluctuation of *A. gossypii*. In order to study the instantaneous effect of weather parameters on population fluctuation of *A. gossypii*, the data of physical factors of environment were analysed for correlation co-efficient values.

RESULTS AND DISCUSSION

The activity of *A. gossypii* was started from 3rd week of December (51th SMW) and continued till 1st week of March (10th SMW) during both the years of experimentation (Table 1). After appearance, it was increased approximately at a rate of two times in subsequent 4 weeks *i.e.* 4th week of December to 3rd week of January during 2011-12 and 2012-13. The increasing rate was approximately 1.5 times during 4th

and 5th week of January (4th and 5th SMW). The activity of this pest was at maximum level on 5th week of January in both the years. During February, pest activity was started to decline at a rate of 0.25 to 0.50 time in both the years. The pest was disappears on coriander crop from 2nd week of March during both the years. The higher activity of the pest was noticed during 3rd week of January to 3rd week of February in 2011-12 and 2012-13.

The correlation co-efficient results indicated that both the predators (Coccinellids and Syrphid fly) were significantly positive associated with aphid incidence on coriander during first and second year of experimentation. Similarly, cumulative number of predators had also significantly positive relationship with aphid population on coriander (Table 2).

The abiotic factors like maximum temperature exhibited significantly negative correlation with aphid incidence on coriander during first and second year of study (Table 2). The negative relationship between maximum temperature and *A. gossypii* in coriander was noted by Ghetiya (1992). The minimum and mean temperature had highly significant negative association with aphid incidence during first year, during second year. Slosser *et al.* (1998) observed negative association between temperature (maximum, minimum and mean) and *A. gossypii* population on cotton.

The morning vapour pressure had significant negative relationship with *A. gossypii* during first year and non-significant negative association during second

Table 1: Population fluctuation of *A. gossypii* on coriander

Standard meteorological week	Month	Week	No. of aphids/3 branches	
			2011-12	2012-13
50	December	2	0	0
51		3	4	8
52		4	13	15
1	January	1	28	30
2		2	59	60
3		3	120	130
4		4	180	190
5		5	220	240
6	February	1	160	200
7		2	120	150
8		3	70	100
9	March	4	30	65
10		1	12	20
11		2	0	0

Table 2: Correlation coefficient (r) between *A. gossypii* incidence and biotic and abiotic factors on coriander

Factors		Correlation co-efficient (r)	
		2011-12	2012-13
Biotic factors			
	Coccinellids	0.970**	0.966**
	Syrphids	0.930**	0.938**
	Total	0.964**	0.969**
Abiotic factors			
	Bright sun shine (hrs)	0.247	-0.102
	Wind speed (kmph)	0.218	0.440
Temperature (°C)	Maximum	-0.656*	-0.554*
	Minimum	-0.738**	-0.257
	Mean	-0.702**	-0.450
Relative humidity (%)	Morning	-0.139	0.077
	Evening	-0.131	0.412
	Mean	-0.011	0.247
Vapour pressure (mm)	Morning	-0.643*	-0.308
	Evening	-0.314	0.041
	Mean	-0.511	-0.136
Vapour pressure deficit (mm)	Morning	-0.183	-0.170
	Evening	-0.391	-0.517
	Mean	-0.340	-0.377

* and ** indicate significance of value at P=0.05 and 0.01 is (r=0.553), (r=0.681), respectively

year. The negative correlation of vapour pressure with *A. gossypii* on okra was observed by Bhoi (2008). Wind speed had positive association with *A. gossypii* activity on coriander crop during both the years but non-significant. The mean vapour pressure, morning, evening and mean vapour pressure deficit were negatively correlated with *A. gossypii* population but non-significant in the first and second year. The bright sunshine hours had positive and negative relationship with aphid incidence on coriander during first and second year of study, respectively but non-significant. Ghetiya (1992), Devi *et al.* (2002) and Dabhi (2008) reported that bright sunshine hours had positive relationship with *A. gossypii* on coriander, brinjal and okra, respectively. Morning, evening and mean relative humidity and evening vapour pressure were negatively and positively associated with aphid population during first and second year, respectively. Ghetiya (1992) reported that morning and evening relative humidity had negative and positive association with *A. gossypii* on coriander, respectively.

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