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## Seasonal incidence of *Hyadaphis coriandari* on fennel and their correlation with biotic and abiotic factors

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#### Abstract

Seasonal incidence of aphid, *Hyadaphis coriandari* on fennel and their correlation with biotic and abiotic factors were studied at Research Farm, College of Agriculture, SKRAU, Bikaner during two consecutive years i.e., Rabi, 2016-17 and 2017-18. The infestation of *H. coriandari* commenced in the second week of Feb (7<sup>th</sup> SMW) and remained active throughout the crop season i.e. upto first week of April during both the years. The population of *H. coriandari* attained to its peak in last week of February/first week of March i.e. 9<sup>th</sup> SMW during both the years. After the peak population, the population of *H. coriandari* started to decline and reached to low level in the 13<sup>th</sup> SMW near maturity of the crop during both the years. Simultaneously the occurrence of predator, *C. septempunctata* coincides with the population of aphids during both the years. Maximum temperature had significant negative correlation and minimum temperature had non significant negative correlation with aphid population during 2016-17 where as maximum and minimum temperature had non significant negative correlation with aphid population during 2017-18. Relative humidity morning and *C. septempunctata* had significant positive correlation with aphid population during both the years. Whereas, relative humidity evening and rainfall had non significant positive correlation with aphid population during both the years (2016-17 and 2017-18).

**Keywords:** Fennel, seasonal incidence, aphid, *Hyadaphis coriandari*, *C. septempunctata*

#### Introduction

Fennel *Foeniculum vulgare* (Miller) is an important spice crop of the family Apiaceae, commonly known as 'saunf' and occupy prominent place among spices in India. India is said to be 'Home of spices' The seed of fennel contain 9.5% protein, 10.0% fat, 18.5% crude fiber, 42.3% carbohydrates, 13.4% minerals and also rich in vitamins and volatile oil ranged from 2.17 to 2.60% (Pruthi, 1976) [11]. The leaves are reported to have diuretic properties, whereas, the root are purgative (El-Awadi and Hassan, 2011; Singh and Singh, 1996) [3, 14]. Among the different pests aphid, *H. coriandari* causes maximum damage to the fennel crop. Both nymph and adult cause damage by sucking the cell sap from tender stem, leaves, inflorescence and developing grains and secreting honey dew. Due to their fast multiplication within few days, aphid cover the entire surface of apical shoots and as a result of continuous feeding by such a large population yellowing, curling and subsequent drying of leaves takes place resulting in poor and shriveled seed formation. The aphid population fluctuates in different months of crop growth period and can be controlled by application of foliar spray timely before emergence of severe infestation of aphid. Keeping it in view, population dynamics of aphid on fennel was studied.

#### Material and Methods

Present investigation on seasonal incidence of aphid, *H. coriandari* were conducted on fennel (variety RF-125) at the Research farm College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner during Rabi 2016-17 and 2017-18. The crop was sown 24<sup>th</sup> October 2016 and 30<sup>th</sup> October 2017 in 100 m<sup>2</sup> (10 x 10 m) area-maintained row to row and plant to plant distance of 40 and 20 cm respectively. The recommended package of practices was followed for raising the crop. The population of aphid was recorded from twenty randomly selected and tagged plants. The visits of the experimental field was made early in the morning at weekly interval to observe the occurrence of aphid. As soon as the aphid population appeared, the numbers were counted from three umbels (lower, middle and upper) of each plants. Simultaneously the data of predator *C. septempunctata* was recorded. The data on weather parameters was obtained from meteorological observatory Agriculture Research Station, Swami Keshwanand Rajasthan Agricultural University, Bikaner.

The correlation coefficient was worked out between aphid population with biotic *C. septempunctata* and abiotic factors (temperature, relative humidity and rainfall).

### Result and Discussion

It was observed that the infestation of fennel aphid, *H. coriandari* commenced in the second week of Feb. which was 7<sup>th</sup> SMW and remained active throughout the crop season *i.e.* upto first week of April during 2016-17 and 2017-2018 (table 1 and 2). The population of aphid ranged between 12.50 to 71.8 and 6.1 to 54.0 aphid/plant during 2016-17 and 2017-18, respectively. Initially, the population of *H. coriandari* was 19.10 & 15.0 per plant during 2016-17 and 2017-18, respectively. The population of *H. coriandari* increased gradually week after week and attained to its peak in last week of February/first week of March *i.e.* 9<sup>th</sup> SMW (71.8 aphids/plant) and (54.0 aphids/plant) during 2016-17 and 2017-2018, respectively. After reaching the peak, the population of aphid started to decline and reached to low level in the 13<sup>th</sup> SMW near maturity of the crop during both the year. These results are in agreement with those of Kalra *et al.*, (2006) [5], Patel *et al.*, (2011) [10], Purti *et al.*, (2017) [12] and Kanjiya *et al.*, (2018) [6] who reported the appearance of *H. coriandari* on fennel in different weeks of February. However, Hirpara (2000) [4], Meena *et al.*, (2009) [8], Pareek *et al.*, (2013) [9] and Swami *et al.*, (2018) [15] reported the incidence of aphid started in the month of January. Contrary to the present findings Kumar and Sagar (1994) [7] recorded *H. coriandari* population during the month of December on coriander. In the present investigation the aphid population increased gradually and reached at its peak in 4<sup>th</sup> week of February/ 1st week of March (9<sup>th</sup> SMW) during 2016-17 and 2017-18. The present findings are in agreement with those of Hirpara (2000) [4], Aslam *et al.*, (2007) [2], Patel *et al.*, (2011) [10], Purti *et al.*, (2017) [12], Pareek *et al.*, (2013) [9] and Swami *et al.*, (2018) [15] who recorded peak incidence of aphid in the 4<sup>th</sup> week of February/ 1st week of March.

Simultaneously the occurrence of predator, *C. septempunctata* coincides with the population of aphids during both the years. The population of *C. septempunctata* ranged between 0.30 to 6.30 and 0.0 to 5.5/plant during 2016-17 & 2017-18, respectively. Initially, the population of *C. septempunctata* was 5.70 & 3.0 per plant in (7<sup>th</sup> SMW) during 2016-17 & 2017-18, respectively. The population of *C. septempunctata* increased gradually week after week and reached to its peak in first week of March *i.e.* 9<sup>th</sup> SMW (6.30/plant) and (5.5/plant) during 2016-17 & 2017-18, respectively. Swami *et al.*, (2018) [15] observed peak activity of *C. septempunctata* with the peak infestation of aphid on coriander similarly Kanjiya *et al.*, (2018) [6] recorded higher population of *C. septempunctata* during 4<sup>th</sup> week of January to 3<sup>rd</sup> week of March. However, Purti *et al.*, (2017) [12] observed highest population of coccinellids in the 2<sup>nd</sup> week of March support the present findings.

### Correlation of *H. coriandari* with biotic and abiotic factors

The correlation between aphid population and abiotic factors *viz.*, maximum & minimum temperature, morning & evening relative humidity and rainfall was worked out during present investigation indicated that maximum temperature exhibited significant negative correlation during 2016-17 however it was non significant negative correlation in 2017-18 (table 3). Singh *et al.*, (2007) reported significant negative correlation

with maximum temperature however, Meena *et al.*, (2009) [8] observed significant positive correlation with atmospheric temperature. Minimum temperature exhibited non-significant negative correlation during both the years *i.e.* 2016-17 & 2017-18. The results are in agreement with those of Hirpara (2000) [4] Ansari *et al.*, (2007) [1], Purti *et al.*, (2017) [12] and Swami *et al.* (2018) [15] reported non significant correlation of minimum temperature with aphid population. Morning relative humidity showed significant positive correlation with aphid population in the present investigation. The results of the present findings are in agreement with those of Purti *et al.*, (2017) [12] who observed significant positive correlation of morning relative humidity with aphid population. In the present findings evening relative humidity showed non-significant positive correlation with aphid population. Singh *et al.*, (2007) [13], Purti *et al.*, (2017) [12] and Swami *et al.*, (2018) [15] observed non-significant positive correlation between evening relative humidity and aphid populations. In the present investigation rainfall showed non-significant positive correlation with aphid population. The results are in agreement with those of Swami *et al.*, (2018) [15] who reported non-significant positive correlation between rain fall and aphid population. A significant positive correlation during 2016-17 and 2017-18 was observed between the population of *C. septempunctata* and aphid on fennel (table 3). Patel *et al.*, (2011) [10], Swami *et al.*, (2018) [15] and Kanjiya *et al.*, (2018) [6] depicted significant positive correlation of coccinellids with aphid population on coriander and fennel crop. However, Meena *et al.*, (2009) [8] reported significant negative correlation between adult coccinellids as well as grubs with aphid population.

The maximum temperature has significantly negative ( $r = -0.620$ ) correlation and minimum temperature has non-significantly negative ( $r = -0.487$ ) correlation with aphid population while morning relative humidity has significantly positive ( $r = 0.551$ ) correlation and evening relative humidity has non-significantly positive ( $r = 0.026$ ) correlation with aphid population and rainfall has non-significant positive ( $r = 0.387$ ) correlation during 2016-17. During 2017-18 maximum and minimum temperature had non-significant negative ( $r = -0.321$  &  $r = -0.196$ ) correlation with aphid population, whereas morning relative humidity has significantly positive ( $r = 0.502$ ) correlation and evening relative humidity has non-significantly positive ( $r = 0.497$ ) correlation with aphid population and rainfall has non-significant positive ( $r = 0.414$ ) correlation. Singh *et al.*, (2007) [13] reported significant negative correlation with maximum temperature however, Meena *et al.*, (2009) [8] observed significant positive correlation with atmospheric temperature. Minimum temperature exhibited non-significant negative correlation during both the years *i.e.* 2016-17 & 2017-18. The results are in agreement with those of Hirpara (2000) [4] Ansari *et al.*, (2007) [1], Purti *et al.*, (2017) [12], and Swami *et al.*, (2018) [15] reported non significant correlation of minimum temperature with aphid population. Morning relative humidity showed significant positive correlation with aphid population in the present investigation. The results of the present findings are in agreement with those of Purti *et al.*, (2017) [12] who observed significant positive correlation of morning relative humidity with aphid population. In the present findings evening relative humidity showed non-significant positive correlation with aphid population. Singh *et al.*, (2007) [13], Purti *et al.*, (2017) [12] and Swami *et al.*, (2018) [15] observed non-significant

positive correlation between evening relative humidity and aphid populations. In the present investigation rainfall showed non-significant positive correlation with aphid population. The results are in agreement with those of Swami *et al.*, (2018) <sup>[15]</sup> who reported non-significant positive correlation between rain fall and aphid population. Patel *et al.*, (2011) <sup>[10]</sup>,

Swami *et al.*, (2018) <sup>[15]</sup> and Kanjiya *et al.*, (2018) <sup>[6]</sup> depicted significant positive correlation of coccinellids with aphid population on coriander and fennel crop. However, Meena *et al.*, (2009) <sup>[8]</sup> reported significant negative correlation between adult coccinellids as well as grubs with aphid population.

**Table 1:** Seasonal incidence of *H. coriandari* on fennel during *Rabi*, 2016-17

SMW*	Period of observations		Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm.)	Aphid population/plant	<i>C. septempunctata</i> population/plant
	From	To	Max.	Min.	Morning	Evening			
7	12-02-2017	18-02-2017	30	10	71.7	23.3	0	19.10	5.70
8	19-02-2017	25-02-2017	30.2	10.6	63.9	18.6	0	40.00	5.10
9	26-02-2017	04-03-2017	30.6	13	68.3	21.7	0	71.80	7.30
10	05-03-2017	11-03-2017	30	11.9	66.3	19.3	0.8	55.70	2.10
11	12-03-2017	18-03-2017	30.7	12.4	63	23	0	38.00	1.20
12	19-03-2017	25-03-2017	36.3	18.4	57.6	21.9	0	22.80	0.70
13	26-03-2017	01-04-2017	41.1	22.5	41.1	18	0	12.50	0.30

\*SMW-Standard meteorological weeks

**Table 2:** Seasonal incidence of *H. coriandari* on fennel during *Rabi*, 2017-18

SMW*	Period of observations		Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm.)	Aphid population/plant	<i>C. septempunctata</i> population/plant
	From	To	Max.	Min.	Morning	Evening			
7	12-02-2018	18-02-2018	28.1	9.3	82	33.1	0	15	3.0
8	19-02-2018	25-02-2018	32.6	13.7	73.9	30.4	0	38	5.1
9	26-02-2018	04-03-2018	32.8	15.4	69.7	28	0.6	54	5.5
10	05-03-2018	11-03-2018	34	14.2	61.3	20.4	0	25.8	5.3
11	12-03-2018	18-03-2018	35	16.9	55.6	17.7	0.8	20	1.2
12	19-03-2018	25-03-2018	33.6	16.4	58.6	23.1	0	11	1.0
13	26-03-2018	01-04-2018	40.7	19.5	35.9	12	0	6.1	0.0

\*SMW-Standard meteorological weeks

**Table 3:** Correlation of *H. coriandari* with biotic and abiotic factors during *Rabi*, 2016-17 and 2017-18

S. No.	Biotic/abiotic factors	Correlation coefficient (2016-17)	Correlation coefficient (2017-18)
1	Maximum temperature	-0.620*	-0.321
2	Minimum temperature	-0.487	-0.196
3	Relative humidity Morning	0.551*	0.502*
4	Relative humidity Evening	0.026	0.497
5	Rainfall (mm)	0.387	0.414
6	<i>C. septempunctata</i>	0.530*	0.839*

\*Significant at 5% level

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