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BIOLOGY OF THE FENNEL APHID, *HYADAPHIS CORIANDRI* (DAS)

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ABSTRACT

Biology of the fennel aphid, *Hyadaphis coriandri* (Das) was studied in laboratory at an average temperature of 30.11°C and relative humidity 81.13 per cent during the year 2006-07. It passed through four distinct nymphal instars. The average body length of first, second, third and fourth instar nymphs measured 0.54 ± 0.04, 0.73 ± 0.03, 0.91 ± 0.05 and 1.14 ± 0.05 mm, with body width of 0.26 ± 0.02, 0.38 ± 0.02, 0.46 ± 0.02 and 0.60 ± 0.04 mm, respectively. The average developmental period of first, second, third and forth instar nymphs were 1.83 ± 0.69, 2.46 ± 0.50, 2.70 ± 0.74 and 1.43 ± 0.50 days, respectively. Total nymphal duration was 8.43 ± 1.30 days. Adult was dark dull yellow to green in colour with a well developed abdomen. The average adult length and width was 1.39 ± 0.03 mm and 0.73 ± 0.03 mm, respectively. The average pre-reproduction, reproduction and post-reproduction periods were 1.76 ± 0.77, 8.43 ± 1.86 and 2.10 ± 1.02 days, respectively. The mean longevity of the adult aphid was observed to be 8.56 ± 1.86 days with a total life span of 16.00 ± 3.08 days. During the life span a female produced 21.13 ± 7.14 nymphs with an average of 5.16 ± 1.53 nymphs per day per female. The fennel aphid could complete 10 overlapping generations on fennel under controlled conditions.

Key words : Biology, fennel aphid

INTRODUCTION

Fennel [*Foeniculum vulgare* (Miller)] commonly known as 'variali' or 'saunf' is an important spice; the seeds have fragrant odour and pleasant aromatic taste used in flavouring soup, sauces, confectionaries, bread rolls, liquor and other edible products. Fennel is infested by insect pests in the field as well as when in store, besides diseases. Among insects, the fennel aphid is responsible to cause severe losses.

MATERIALS AND METHODS

Initial culture of the fennel aphid was raised on fennel plants grown at the insectory of Department of Entomology, C.P. College of Agriculture, S.D.A.U., S.K. Nagar. Nymphs and adults were then collected from the infested plants and shifted to fennel plants in pots covered with glass chimney. Aphids collected from the pot plants were further reared individually in Petridishes. Fresh fennel leaves were provided daily as food and aphids were transferred gently on new leaves daily.

To study the nymphal duration newly laid nymphs were transferred individually to Petridishes having fresh fennel leaves. The food was changed daily in the morning. The number of nymphs as well as change of nymphal instar was confirmed by the presence of exuviae caste off in petridishes and the date of moulting that was recorded. From these data total duration of the nymphal stage was worked out. The colour and shape of all nymphal instars were observed critically and noted after moulting. The size of each nymphal instar (length and breadth) was measured under compound microscope with the help of an ocular micrometer after calibrating it with a stage micrometer.

The aphid nymph after fourth moult attained adulthood. Twenty five newly developed adults were reared individually in petridishes and maintained separately for the study of longevity of adult. The length and width of adults were measured as described earlier for nymphs.

To study reproductive aspects, nymphs after fourth moult were reared individually in separate petridishes. The pre reproductive period was considered from the fourth moulting to the starting of nymph laying. The number of days for which a given aphid continues to reproduce was considered as reproductive period. The post reproductive period was the period between birth of last young one to the death of adult. The numbers of young ones produced by single aphid were counted daily and considered as its reproductive capacity. Entire life span of aphid was worked out from date of freshly emerged nymphs to death of adult.

In order to record the number of generations a study was made during the crop season in 2007-2008. Fennel was raised in 10 pots (1 plant each) and freshly laid nymphs were singly was released on the tender parts of fennel plant. The fennel plant was covered with glass chimney and the open end was covered with muslin cloth in order

Table 1. Measurement and size of nymphal instars and adult of fennel aphid, *H. coriandri*

Stage	Body length (mm)			Body width (mm)			Antennal length (mm)	Cornicle length (mm)
	Max	Min	Average	Max	Min	Average		
Ist instar	0.60*	0.46	0.54 ± 0.04	0.31	0.22	0.26 ± 0.02	0.24 ± 0.02	0.04 ± 0.001
IInd instar	0.79	0.68	0.73 ± 0.03	0.42	0.31	0.38 ± 0.02	0.32 ± 0.03	0.06 ± 0.001
IIIrd instar	1.01	0.84	0.91 ± 0.05	0.50	0.43	0.46 ± 0.02	0.45 ± 0.02	0.10 ± 0.01
IVth instar	1.25	1.03	1.14 ± 0.05	0.70	0.50	0.60 ± 0.04	0.54 ± 0.02	0.14 ± 0.01
Adult	1.46	1.34	1.39 ± 0.03	0.78	0.67	0.73 ± 0.03	0.70 ± 0.03	0.22 ± 0.03

* Values presented are a mean of 25 nymphs.

prevent the escape of the nymph. The nymph attained maturity and started laying nymphs. All newly born nymphs and adults were removed leaving behind only one nymph on each plant. The same process was continued with newly born nymph of subsequent generations till the plant survived.

RESULTS AND DISCUSSION

Biology : The first instar nymph was delicate, transparent, oval in shape and dull white to light yellow in colour. A pair of long setaceous antennae was also conspicuous. The compound eyes were small and blackish to brown. The freshly moulted second instar nymph was transparent to dirty yellow in colour and had visible cornicles. The cauda was paler than siphunculi and had pairs of hairs. The third instar nymph was more or less similar to preceding instar in general appearance, but differed in its comparative size. The compound eyes were clearly six segments could be counted. The cornicles were prominent, long, tubular, dark brown to black in colour. The compound eyes were bulging and reddish black in colour. Legs were rather stout, long and covered with hairs. The methathoracic legs were longer than prothoracic and mesothoracic pair. The abdomen was dark green, mottled with darker patches around the base of each siphunculi. The cauda was paler than the siphunculi and usually with six or more than six hairs.

H. coriandri passed through four nymphal instars before attaining adult stage on fennel. The duration of first, second, third and fourth instars was on an average 1.83 ± 0.69, 2.46 ± 0.50, 2.70 ± 0.74 and 1.43 ± 0.50 days, respectively. Hirpara (2000) also recorded four nymphal instars for *H. coriandri* before attaining adult stage under Junagadh condition. The linear measurements of different nymphal instars and the adult have been presented in Table 1.

Table 2. Duration of different nymphal and the adult fennel aphid, *H. coriandri* under laboratory conditions

Stage	Temperature			Relative Humidity (%)			Duration (Days)*		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
Ist instar	27.6	31.1	29.35	21.00	87.33	54.16	1	3	1.83 ± 0.69
IInd instar	27.6	31.2	29.40	19.00	86.66	53.33	2	3	2.46 ± 0.50
IIIrd instar	25.4	31.2	28.30	42.16	85.33	63.75	2	4	2.70 ± 0.74
IVth instar	25.4	28.2	26.80	40.80	88.60	64.70	1	2	1.43 ± 0.50
Adult	25.4	31.2	28.30	40.09	86.63	63.36	6	11	8.43 ± 1.30

* Based on 30 observations

little bigger and round than the second instar nymph. The fourth instar nymph was dark dull yellow to green in colour and elongated in shape. The cornicles were seen as long tubular structures and were clearly visible to naked eyes. The compound eyes were enlarged and reddish black in colour.

The colour of the adult was more or less similar to the fourth instar nymph. It had a well developed abdomen. The antennae were fairly short than the body length and

The total nymphal period varied from 6 to 11 days with an average of 8.43 ± 1.30 days. The average longevity was 8.56 ± 1.86 days. The mean life span of the aphid was 16.00 ± 3.08 days. The mean pre-reproductive, reproductive and post-reproductive periods were 1.76 ± 0.77, 8.43 ± 1.86 and 2.1 ± 1.02 days, respectively at an average temperature of 30.11°C and relative humidity of 81.13 per cent. The reproductive capacity was 21.13 ± 7.14 nymphs per female. The rate of reproduction was observed to be 5.16 ± 1.53 nymphs per day per female.

Table 3. Duration of different generations of *H. coriandri* reared on fennel under laboratory conditions during 2007

Generation	Period of study	Duration (Days)	Average Temperature (°C)	Relative Humidity (%)
First	Feb. 19-26	7.1 ± 0.87*	23.88 ± 1.62	53.12 ± 4.91
Second	Feb. 26 – March 6	8.8 ± 1.22	22.72 ± 1.57	53.88 ± 8.14
Third	March 6 – 13	7.3 ± 0.82	24.16 ± 1.55	50.81 ± 9.40
Fourth	March 13 –19	7.0 ± 0.66	25.76 ± 2.12	41.28 ± 9.70
Fifth	March 19 – 26	7.1 ± 0.56	25.98 ± 1.86	43.62 ± 11.88
Sixth	March 26 – April 1	6.9 ± 0.73	28.65 ± 1.13	36.5 ± 2.62
Seventh	April 1 – 7	6.7 ± 0.67	28.87 ± 2.17	31.64 ± 8.84
Eighth	April 7 – 13	6.5 ± 0.70	30.82 ± 1.22	38.24 ± 5.79
Ninth	April 13 – 19	6.1 ± 0.31	31.92 ± 1.37	46.42 ± 7.66
Tenth	April 19 – 25	6.6 ± 0.69	31.07 ± 1.36	48.57 ± 7.71
	Mean	7.01 ± 0.72	27.32 ± 3.28	44.41 ± 7.46

* Data presented are a mean of 10 aphids

The fennel aphid, *H. coriandri* completed ten overlapping generations. The generation period was shortened when the mean room temperature and relative humidity were comparatively higher.

According to Kumar and Sagar (1996) mean duration of first, second and third instar nymphs varied from 1.35 ± 0.08 to 2.35 ± 0.12; 1.55 ± 0.11 to 3.69 ± 0.13 and 1.71 ± 0.11 to 6.00 ± 0.21 days, respectively; whereas, Hirpara (2000) reported that first, second, third and fourth nymphal duration was 1.48 ± 0.45, 3.20 ± 1.84, 2.84 ± 0.50 and 1.36 ± 0.48 days, respectively. The total nymphal duration was recorded as 8.16 ± 1.59 days at an average temperature of 26.22°C and relative humidity of 68.66 per cent.

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