

Biology of aphid, *Hyadaphis coriandri* (Das) on coriander, (*Coriandrum sativum* L.) under Laboratory conditions

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(Received: 05 July 2023; Revised: 04 August 2023; Accepted: 05 September 2023; Published: 15 September 2023)

(Published by Research Trend)

ABSTRACT: Aphid, *Hyadaphis coriandri*, is a well-known and economically significant aphid species that attracts the attention of many professionals in various field. In a laboratory study of the biology of the coriander aphid, *H. coriandri* (Das), it was discovered that there were four nymphal instars. The duration of the aphid's first, second, third, and fourth nymphal instars was 1.50 ± 0.50 , 1.25 ± 0.25 , 1.00 ± 0.50 , and 1.75 ± 0.25 days, respectively, while the length of the entire nymphal stage was 5.75 ± 1.26 days. The aphid's pre-reproductive, reproductive, and post-reproductive phases ranged from 1.25 ± 0.76 , 5.50 ± 2.54 , and 1.50 ± 0.50 days, respectively. Adult aphids lived for a total of 12.25 ± 4.31 days. 5.50 ± 3.55 nymphs might be produced daily by adult females, for a lifetime average of 27.5 ± 17.78 nymphs.

Keywords: *Hyadaphis coriandri*, Coriander, Biology, Life cycle, Integrated pest management.

INTRODUCTION

At least in tropical regions of the planet, this aphid species is exceptionally polyphagous, polymorphic, and uninterrupted parthenogenetic. By sucking the cell sap from delicate stems, leaves, inflorescences, and growing grains and secreting honey dew, both nymphs and adults harm crops (Pareek *et al.*, 2013; Meena *et al.*, 2017). Aphids quickly multiply within a few days to the point where they cover the whole surface of apical shoots (Swami *et al.*, 2018). As a result of this continuous feeding by such a high population, the leaves begin to yellow, curl, and eventually dry out, which leads to poor and shrunken seed production. Planning the pest management schedule requires an understanding of the biology of the pest. The biology of the aphid infesting the coriander crop under laboratory conditions was therefore included in this work.

MATERIALS AND METHODS

During the months of February and March 2021, investigators researched the biology of *Hyadaphis coriandri* on coriander in a lab facility with temperature ranges of ($26 \pm 2^\circ\text{C}$) and relative humidity levels of ($65 \pm 5\%$). The coriander plants and aphids were obtained from the field, and they were raised in petri dishes (10 cm in diameter) on coriander leaves and fragile umbels. Filter paper that had been wet was used to line the bottom of the Petri dishes. To prevent physical harm to the mature aphid, it was moved into the petri dish with the use of a fine camel hair brush. Twenty nymphs will be kept for ongoing observation and daily morning meal changes. Daily observations were made using a

binocular microscope to record them. The length of nymphs and adults, as well as their pre-reproductive, reproductive and post-reproductive cycles, overall life spans, and reproductive potential, were observed and examined.

A. Nymphs

Newly laid nymphs were moved to petri dishes with fresh coriander leaves and umbels (one nymph per petri dish) in order to observe the nymphal stage. Exuvia cast off in the petri dishes served as confirmation for the number and length of nymphal instars.

B. Adult

Nymphs reached adulthood after their fourth instar's last moult. In order to explore the pre-reproductive, reproductive, post-reproductive and adult longevity periods, the freshly produced adults were raised individually in Petri dishes.

The fourth moulting (adult emergence) to the beginning of nymph laying were regarded to be the reproductive period. The length of time an aphid continued to reproduce was considered its reproductive period. The post-reproductive period was defined as beginning with the birth of the last child and ending with adult mortality. Every day, the number of offspring one aphid generated was tallied. All reproductive aspects, adult longevity, and overall life span were calculated as a result.

RESULT

A. Nymph

The findings shown in Table 1 showed that, under laboratory circumstances with room temperature

ranging from ($26 \pm 2^\circ\text{C}$) and relative humidity of ($65 \pm 5\%$), the first instar nymphal period varied from 1.0 to 2.0 days with an average of 1.5 ± 0.50 days. The newly laid first instar nymphs had a pear form, were delicate

without wings, and were light green in color. As they grew older, they turned dark green. The nymph underwent four instars during the course of its development.

Table 1: Biology of *H. coriandri* on Coriander (Rabi 2020-21).

Sr. No.	Particulars	No. of individuals observed	Observations		$\bar{x} \pm \sigma$
			Minimum days	Maximum days	
1.	Nymphs				
	a. 1 st instar period (days)	20	1.0	2.0	1.5 ± 0.50
	b. 2 nd instar period (days)	20	1.0	1.5	1.25 ± 0.25
	c. 3 rd instar period (days)	19	0.5	1.5	1.00 ± 0.50
	d. 4 th instar period (days)	17	1.0	2.0	1.75 ± 0.25
	e. Total nymphal period (days)	17	4.5	7.0	5.75 ± 1.26
2.	Adult				
	a. Pre-reproductive period (days)	17	0.5	2.0	1.25 ± 0.76
	b. Reproductive period (days)	16	3.0	8.0	5.50 ± 2.54
	c. Post-reproductive period (days)	16	1.0	2.0	1.50 ± 0.50
	d. Adult longevity (days)	16	5.0	11.0	8.00 ± 3.04
3.	Total life span (days)	16	8.0	16.5	12.25 ± 4.31
4.	Reproductive potential				
	a. (nymph/day/adult)	16	2.0	9.0	5.50 ± 3.55
	b. (nymphs/adult)	16	10.0	45.0	27.5 ± 17.78

Temperature during study period $26 \pm 2^\circ\text{C}$; Relative humidity during study period 65 ± 5 percent; \bar{x} = Mean aphid population
 σ = Standard deviation of mean aphid population

At the current temperature and humidity, the second instar nymphal period ranged from 1.0 to 1.5 days, with an average of 1.25 ± 0.25 days. Nymphs in their third instar retained essentially the same color as those in their second, with the exception of size. The average length of the third instar nymphal phase was 1.00 ± 0.50 days. Nymphs in their fourth instar develop an elongated shape and a dark green color. The nymphs moved quickly when startled and were quite active. The average length of the fourth instar nymphal phase was 1.75 ± 0.25 days, although it might be as long as 2.0 days. At room temperature, the overall nymphal time ranged from 4.5 to 7.0 days, with an average of 5.75 ± 1.26 days.

B. Adult

The adults had an elongated, pear-shaped body and were dark green in color. The legs were long, thick, and hair-covered. The cornicles are longer, darker tubes in color. According to the data in Table 1, the adult female's pre-reproductive period ranged from 0.5 to 2.0 days, with an average of 1.25 ± 0.76 days. After that, the female begins giving birth to children. The adult female's post-reproductive period, which lasted from 1.0 to 2.0 days with an average of 1.50 ± 0.50 days after died, varied from 3.0 to 8.0 days with an average of 5.50 ± 2.54 days. At the current temperature and humidity, the mature aphid longevity ranged from 5.0 to 11.0 days, with an average of 8.00 ± 3.04 days.

C. Total life span

Total life span, measured from the first instar nymph to the death of the aphid, was found to be between 8.0 and 16.5 days, with an average of 12.25 ± 4.31 days.

D. Reproductive potential

A single female could produce between 2.0 and 9.0 young every day, with an average of 5.50 ± 3.55 days.

In her lifetime, a single female gave birth to 10.0 to 45.0 nymphs on average every 27.50 ± 17.78 days.

DISCUSSION

In a lab setting, the biology of *H. coriandri* on coriander was investigated. In the current study, it was discovered that *H. coriandri* underwent four nymphal instars, with a total nymphal period of 5.75 ± 1.26 days. The duration of the aphid's first, second, third, and fourth nymphal instars was 1.50 ± 0.50 , 1.25 ± 0.25 , and 1.00 ± 0.50 days, respectively. During the pre-reproductive, reproductive, and post-reproductive periods of 1.25 ± 0.76 , 5.50 ± 2.54 , and 1.50 ± 0.50 days, respectively, the adult longevity ranged from 5.00 to 11.00 days. In her lifetime, a single female gave birth to an average of 27.50 ± 17.78 nymphs, ranging from 10.00 to 45.00. Female fecundity ranged from 2 to 9.00 young per day (average: 5.50 ± 3.55).

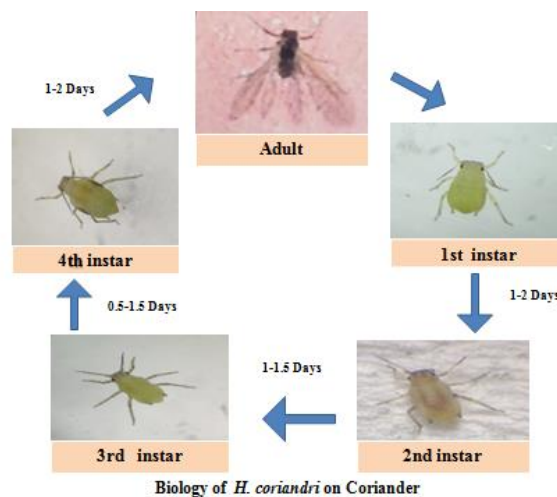
The current results are consistent with those of Pareek (2009), who investigated the biology of the aphid, *H. coriandri*, in a lab setting using two different coriander varieties, the most susceptible (RCr-41) and the least susceptible (RCr-436) kinds. The first second, third and fourth instar nymphal period were 1.40 ± 0.51 ; 2.23 ± 0.26 ; 1.60 ± 0.51 ; 2.39 ± 0.40 and 1.08 ± 0.35 ; 1.97 ± 0.51 ; 1.81 ± 0.25 ; 2.22 ± 0.26 days on most susceptible and least susceptible varieties, respectively. The total nymphal period was 5.88 ± 0.90 and 8.75 ± 0.67 days on RCr-41 and RCr-436 varieties respectively. The pre reproductive, reproductive and post reproductive periods of adult female were 0.78 ± 0.26 ; 1.31 ± 0.25 ; 6.28 ± 1.30 and 5.47 ± 1.24 ; 4.44 ± 0.40 and 3.63 ± 0.39 days on most susceptible and least susceptible varieties respectively. The reproductive potential of adult female was 6.31 ± 1.40 and 4.75 ± 1.25 nymphs per day on most susceptible and least

susceptible varieties respectively. However, during life span, the reproductive potential of female was 38.56 ± 6.99 nymphs and 25.43 ± 6.67 nymphs on most susceptible and least susceptible varieties respectively. The adult survived for 11.88 ± 0.76 days and 10.41 ± 1.16 days on most susceptible and least susceptible varieties respectively.

In a similar results, Meena (1993) noted that the first, second, third, and fourth nymphal instars were completed in 2 to 3 days, respectively, while the total nymphal period ranged from 8.62 to 11.12 days (Average 9.77 ± 0.95 days), and adult longevity was 10 to 16.5 days (Average 13.04 ± 1.85 days). The above findings are only partially supported by the pre-

reproductive, reproductive, and post-reproductive phases, which were 1 to 2.5 (Average 1.65 ± 0.41), 7 to 11 (Average 9.08 ± 1.32), and 1.5 to 3.0 (Average 2.22 ± 0.53) days, respectively.

The current findings concur with those made by Hake. (2009), who observed that the first, second, third, and fourth instar phases lasted 1.45 ± 0.41 , 1.60 ± 0.34 , 1.26 ± 0.42 and 1.82 ± 0.24 days each, respectively, and that the entire nymphal time ranged from 4.5 to 7.5 days (with an average of 5.88 ± 0.82 days). Further evidence supporting the present conclusion comes from their reported adult longevity of 8.45 ± 2.09 days and pre, reproductive, and post-reproductive periods of 1.11 ± 0.37 , 5.09 ± 1.42 , and 1.56 ± 0.51 days, respectively.



CONCLUSIONS

The nymphal instars of *H. coriandri* were completed in four stages. Adult longevity was 8.00 ± 3.04 days and the total nymphal duration was 5.75 ± 1.26 days. The adult female's capacity for reproduction was 5.50 ± 3.55 nymphs every day and 27.50 ± 17.78 nymphs per female during the course of her lifetime.

Acknowledgement. The author is thankful to Dr. H.L. Deshwal, Professor, Department of Entomology, SKRAU, Bikaner for providing facilities required for conducting the above experiment.

Conflict of Interest. None.

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How to cite this article: Vijay Kumar, H.L. Deshwal, S.K. Yadav, Mahendra and Manoj Kumar Gurjar (2023). Biology of aphid, *Hyadaphis coriandri* (Das) on coriander, (*Coriandrum sativum* L.) under Laboratory conditions. *Biological Forum – An International Journal*, 15(9): 861-863.