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Biology of bean aphid, *Aphis craccivora* Koch on field bean

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Abstract

Studies on the biology of aphid, *Aphis craccivora* Koch on field bean was carried out under laboratory condition at the Department of Agricultural Entomology, University of Agricultural and Horticultural Sciences, Navile, Shivamogga during 2017-2018. The results indicated that *A. craccivora* Koch passed through four nymphal instars. The average duration of first, second, third and fourth instar nymphs were 1.47 ± 0.37 days, 1.36 ± 0.47 days, 1.19 ± 0.22 days and 1.41 ± 0.39 days, respectively with total nymphal duration of 5.43 ± 1.05 days. The average length of first, second, third and fourth instar nymphs were 0.54 ± 0.25 mm, 0.86 ± 0.12 mm, 1.13 ± 0.07 mm and 1.57 ± 0.03 mm, respectively. The average longevity of adult was 10.65 ± 0.66 days. Adults measured 2.25 ± 0.08 mm in length and 1.16 ± 0.08 mm in width. Average pre-reproduction, reproduction and post-reproduction period were 1.39 ± 0.32 days, 9.4 ± 0.77 days and 1.28 ± 0.29 days, respectively. The total life span of *Aphis craccivora* was 17.66 ± 2.37 days. The reproductive potential of the aphid was 29 ± 4.34 nymphs per female.

Keywords: Biology, bean aphid, *Aphis craccivora*, laboratory, seasonal incidence

Introduction

The dolichos bean, *Lablab purpureus* (Linnaeus) Sweet, belongs to the family leguminaceae is an important pulse cum vegetable crop. In India, it is cultivated for its tender and mature pods, seeds and also for fodder. In India, it is being cultivated in Karnataka, Tamil Nadu, Andhra Pradesh and Kerala. Karnataka state contributes a major share by producing about 0.58 lakh tones with a productivity of 1039 kg / ha from an area of 0.59 hectares^[1]. It grows fast with beautiful fragrant flowers that attract butterflies. Field bean is primarily grown for its green pods that are consumed as cooked or fried vegetable. Its immature seeds are also consumed after cooking. Field bean is an important source of proteins, minerals and dietary fibers. Its pods have a characteristic aroma and the pod walls have high fiber content. The crop is attacked by a number of insect pests, viz., bean aphid, *Aphis craccivora* Koch, leaf hopper, *Empoasca fabae* Harris, *Empoasca krameri* Ross & Moore, *Empoasca kerri* Pruthi, pod borer, *Etiella zinckenella* Treitschke, whitefly, *Bemisia tabaci* Gennadius, stem fly, *Ophiomyia phaseoli* Tryon, hairy caterpillars, *Ascotis imparta* Walker, Bihar hairy caterpillar, *Spilosoma obliqua* Walker etc. Among these insect pests, bean aphid (*A. craccivora*) causes considerable crop damage. Bean aphid, *Aphis craccivora* Koch (Homoptera: Aphididae) was first described by Koch in 1854 and is commonly known as cowpea aphid, black bean aphid, legume aphid and oriental pea aphid. Aphids are the major insect pest both in tropical and temperate regions^[3]. It is cosmopolitan species. Throughout the world it is causing direct and indirect (as vectors) damage to cultivated crops. The aphid, *Aphis craccivora* is highly polyphagous as it is recorded feeding on plants belonging to eight plant families. It is a serious pest of leguminous crop and sucks the sap from tender shoots, inflorescence and pods resulting in the drying up of tender shoot and premature fall of flower buds, flowers and tender pods. Crops attacked by this aphid include cowpea, field bean, groundnut, chickpea, mung bean, urd bean, pigeon pea, brassicas, cucurbits, beetroot, cotton, etc.^[1]. In case of severe infestation, these pests attack all parts of the plants including pods which results in stunted growth and decreased yield. The honey dew secretion of the aphids provides a suitable media for the development of sooty mould and fungi which ultimately hampers the process of photosynthesis^[2]. It acts as a vector of many plant viruses such as rosette, mottle, stunt and stripe^[5]. Bean aphid is polymorphic (with apterous and alate form), viviparous and in the tropics parthenogenetic reproduction occurs throughout the year.

The pest is highly difficult to manage because of its polyphagous nature with very short life cycle and high reproduction rate. Hence, to find out the detailed biology of this bean aphid, a research study entitled "Biology of bean aphid, *Aphis craccivora* Koch on Field bean" was conducted under laboratory conditions.

Materials and Methods

The present investigation was carried out at the Department of Entomology, College of Agriculture, UAHS Shivamogga during 2017-2018. Large numbers of apterous aphids were collected from the field and a laboratory stock culture was maintained. The freshly deposited first instar nymphs were collected from the stock culture and transferred individually into a separate petridish with the help of camel hair brush. Tender field bean leaves were provided as food source. Observations on the duration of different instar, duration of pre-reproductive, reproductive, post-reproductive, adult longevity (days), fecundity (nymphs/female) and total life cycle were recorded. The raw data of the entire sample were transferred in an electronic format in a spreadsheet layout (Microsoft excel). The data was finally analyzed to calculate the mean days and standard deviation.

Results and Discussion

The aphid completed four nymphal instars before reaching adult stage. Adults reproduced parthenogenetically and viviparously. The first instar nymph was light green and had pear shaped bodies, first instar nymph subsequently changed to light green to light brown and brown to dark brown color with elongated pear-shaped body in second, third and fourth instars, respectively. The adults were soft bodied, pear-shaped and shiny black in color with white appendages. The four nymphal instars lasted 1.47, 1.36, 1.19 and 1.41 days, respectively on field bean (Table 1). The average length of first, second, third and fourth instar nymphs was 0.54 ± 0.25 mm, 0.86 ± 0.12 mm, 1.13 ± 0.07 mm and 1.57 ± 0.03 mm, respectively. The average width of first, second, third and fourth instar nymphs was 0.31 ± 0.03 mm, 0.43 ± 0.15 mm, 0.51 ± 0.24 mm and 0.71 ± 0.07 mm, respectively (Table 2). This is in line with [4] who reported the total nymphal period of 5.30 days. However, [6] noticed shorter developmental period (4.86 days) on cowpea. The duration of average nymphal instar on cowpea was 4.84 ± 0.04 days as reported by [7]. The nymphal measurements observed in this study are similar to that of [6]. The present observations indicated that the aphid reproduced parthenogenetically and viviparously. Ten newly emerged adults were observed for their pre-reproduction, reproduction and post-reproduction periods. During the study period the average temperature was $25 \pm 1.5^\circ\text{C}$. Pre-reproductive period ranged from 1.00 to 1.60 days with a mean of 1.39 ± 0.32 days. Reproductive duration lasted for 8.00 to 10 days with a mean of 9.40 ± 0.77 days. Post-reproductive period ranged from 1.00 to 1.60 days with a mean of 1.28 ± 0.29 days and these results are comparable with the results of [6]. However, post-reproductive days were more compared to the reports of [6]. This might be due to variation in climatic conditions.

The reproductive potential of *A. craccivora* was studied by counting the number of individuals produced by each adult aphid during its reproduction period. The female had produced minimum of 23 and maximum of 36 individuals with an average of 29 ± 4.34 nymphs per female (Table 3). It was more compared to reports of [6] who reported that

fecundity was 23.37 ± 7.67 nymphs per female. [7] reported 47.50 ± 16.73 nymphs per female on cowpea. The difference in the development periods and fecundity might be due to individual innate capacity, food availabilities and also changed climatic conditions.

The total life period (birth to death of individual) of *A. craccivora* varied from 15 to 21 days with an average of 17.66 ± 2.37 days (Table 3) on field bean which are in close conformity with [6] who reported 16.75 ± 0.91 days, and also with [4] who reported total life cycle of 19.85 days.

Table 1: Duration of nymphal period at different nymphal instars of *Aphis craccivora* on field bean

Nymphal stage	Nymphal developmental period (days)	Mean \pm SD(days)
1 st instar	1.0-2.0	1.47 \pm 0.37
2 nd instar	1.0-1.6	1.36 \pm 0.47
3 rd instar	1.0-1.5	1.19 \pm 0.22
4 th instar	1.0-2.0	1.41 \pm 0.39
Total nymphal period	4.5-7.7	5.43 \pm 1.05

N=10

Table 2: Pre-reproductive period, reproductive period, post-reproductive period, Adult longevity and fecundity of *Aphis craccivora*

Parameter	Range	Mean \pm SD
Pre-reproductive period (days)	1.0-1.6	1.39 \pm 0.32
Reproductive period (days)	8.0-10	9.4 \pm 0.77
Post-reproductive period (days)	1.0-1.6	1.28 \pm 0.29
Adult longevity (days)	10.00-12.00	10.65 \pm 0.66
Fecundity(eggs/female)	23-36	29 \pm 4.34
Total life cycle	15-21	17.66 \pm 2.37

N=10

Table 3: Morphometric data of field bean aphid, *Aphis craccivora*

Sl. No	Insect stage	Length (mm)		Width (mm)	
		Range	Mean \pm SD	Range	Mean \pm SD
1.	1 st instar	0.06-0.72	0.54 \pm 0.25	0.26-0.36	0.31 \pm 0.03
2.	2 nd instar	0.72-1.1	0.86 \pm 0.12	0.04-0.52	0.43 \pm 0.15
3.	3 rd instar	1.04-1.24	1.13 \pm 0.07	0.06-0.7	0.51 \pm 0.24
4.	4 th instar	1.52-1.64	1.57 \pm 0.03	0.64-0.7	0.71 \pm 0.07
5.	Adult	2.1-2.34	2.25 \pm 0.08	1.04-1.36	1.16 \pm 0.08
6.	Alate	1.8-2.7	2.12 \pm 0.27	1.04-1.54	1.17 \pm 0.13

N=10

Conclusion

The total life cycle of bean aphid, *Aphis craccivora* was 17.66 ± 2.37 days with four nymphal instars in the laboratory condition. The reproductive potential of the aphid was 29 ± 4.34 nymphs per female. The result outcome of biology of the bean aphid will help for making accurate management decisions and for selecting proper measures to control this pest.

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References

- Anonymous. Institution of agricultural technologists diary, queens road, Bangalore 2014, 60.
- Anonymous. Datasheet – *Aphis craccivora*. URL: <http://www.cabi.org/isc/datasheet/6192> 2013.

3. David BV, Kumarswami T. Elements of Economic Entomology. Popular Book Depot. (3rd Ed) Madras 1982, 173.
4. Gurjar PA, Radadia GG, Pandya HV. Biology of *Aphis craccivora* Koch on cowpea. Insect. Env 2007;**13**:73-75.
5. Porter DM, Smith DH, Rodriguez-Kabana R. Compendium of peanut disease. St. Pauls. Minnesota 1984, 18-226.
6. Rani R. Bio-ecology of aphid, *Aphis craccivora* Koch and evaluation of fungal pathogen, *Fusarium semitectum* Berk and Ravenel against cowpea aphid. M.Sc. (Agri) thesis, UAS, Bangalore, India 2008.
7. Srikanth J, Lakkundi NH. Instar period, fecundity and longevity of cowpea aphid, *Aphis craccivora*, Koch on seven leguminous hosts. J. Aphidology 1988;2(1 , 2):18-21