

MORPHOMETRIC STUDIES OF GREEN APPLE APHID (*APHIS POMI* DE GEER) (APHIDIDAE: HEMIPTERA)

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Abstract—Aphids are one of the major pests which harm crops worldwide. Among them green apple aphid (*Aphis pomi*) is one of the most important species of aphids commonly occurring in apple orchards of Kashmir. For controlling these aphids, the morphological identification is one of the important key. Therefore morphometry of *Aphis pomi* was studied using Scanning Electron Microscope in the division of Entomology. In this study the measurement of different instars of *Aphis pomi* were undertaken viz, width and length of body, wings and legs. The morphometric analysis showed gradual developmental variations from first instar to adult stage in size, shape, colour and number of characters. The body length and breadth of different nymphal stages of *Aphis pomi* were $(0.72\pm 0.02) \times (0.33\pm 0.01)$, $(0.92\pm 0.01) \times (0.49\pm 0.02)$, $(1.05\pm 0.03) \times (0.64\pm 0.02)$ and $(1.21\pm 0.05) \times (0.78\pm 0.03)$ respectively. The Adult Aphids range in colour from light green to dark green, with an orange-yellow head having body breadth (1.02 ± 0.21) mm and length (1.52 ± 0.07) mm.

INTRODUCTION

A variety of insect pests prey on apple plants. Among these, the green apple aphid is regarded as a pest that seriously harms apple nursery plants. This aphid is tiny, yellow-green in colour, and has a dark cauda and Siphuneuli. It colonises young host plants, harming apple nursery plant seedling supplies (Blackman and Eastop, 2000). De Geer (1773), who investigated the life history of this aphid pest in Sweden, made the first record of it. This species is currently present wherever apple plants are planted, which is a well-known fact. This species often infests nurseries and easily moves from one area to another on nursery stock (Baker and Tuner 1916). The apple plant is the primary host of the monoecious green apple aphid. *Aphis pomi* can be found in great numbers in the summer and fall, depositing honeydew that can occasionally turn fruit a rusty colour. A good substrate for sooty

mould is honey dew. High population concentrations in the spring can taint fruits and possibly slow down the growth of young plants' shoots. Like biological studies morphometric, study is also important for pest identification and also a key component for management of the pest. Many studies on the biology of aphids have been conducted in the past, including those by Baker and Tuner (1916) in North America and Gautum and Kumari (2004) in Shimla and by Gupta and Tara (2015) in Jammu. But studies lack acknowledge on the morphometry of this pest. Since effective and environmentally friendly pest management solutions are always based on life cycle and morphometric studies of the insect. The study on morphometry of *Aphis pomi* has been carried out.

MATERIALS AND METHODS

A stock culture was maintained on small potted apple plants under laboratory conditions and

(²Head)

aphids were taken from it for morphometric studies. Freshly emerged nymphs were separated gently and anesthetized in 70 per cent ethyl alcohol. The length was measured from anterior to posterior extremities of the body, while breadth was measured across the mesothorax. Twenty nymphs were chosen and measured under the compound microscope with the help of ocular and stage micrometer and the mean values were calculated.

RESULTS AND DISCUSSION

The nymphs of *A. pomi* passed through four instars to reach the adult stage. The newborn nymphs were green in colour and lively as soon as they were born. Based on the measurements of 10 nymphs, the dimensions were 0.56-0.76(0.72±0.02) mm length and 0.28-0.33 (0.33±0.01) mm breadth. The nymph's antennae were located on its deflexed head. The four segmented antennae have a length of 0.34-0.41 (0.38±0.007) mm. The second instar nymphs were also green in colour and extremely active. Body width ranged from 0.39-0.59 (0.49±0.02) mm and length ranged from 0.85-1.00 (0.92±0.01) mm. The antennae were 0.38-0.61(0.49±0.032) mm and had five segments. The third instar's colour resembled that of the first and second instars. Body dimensions were from 0.95-1.27 (1.05±0.03) mm length and 0.54-0.76 (0.64±0.02) breadth, respectively. The five segmented antennae have a length of 0.49-0.68(0.60±0.025). However the fourth instar's colour

changes to a pale green and takes on a yellowish hue. Body width ranged from 0.61-0.91(0.78±0.03) mm and length ranged from 1.00-1.60 (1.21±0.05) mm. The six segmented antennae have a length of 0.79-0.96 (0.85±0.021) mm. Adult aphids range in colour from light green to dark green, with an orange-yellow head. Body breadth ranged from 0.74-1.33(1.02±0.21) mm and length ranged from 1.12-1.72(1.52±0.07) mm. The length of the antenna was 1.12-1.91 (1.44±0.099) mm. The present investigation in respect of biology revealed that both 1st, 2nd and 3rd instar nymphs were green while as the colour turns light green to dark green in fourth instar nymph. Morphometries (length x breadth) of 1st, 2nd, 3rd and 4th instar nymphs were (0.72±0.02) x (0.33±0.01), (0.92±0.01) x (0.49±0.02), (1.05±0.03) x (0.64±0.02) and (1.21±0.05) x (0.78±0.03) mm respectively. The antennal length of 1st, 2nd, 3rd and 4th instar nymphs measured 0.38±0.007, 0.49±0.032, 0.60±0.025, 0.85±0.021, mm respectively. While as the length of fore, mid and hind legs of 1st, 2nd, 3rd, and 4th instar nymphs measured (1.04±0.012, 0.39±0.016, 0.45±0.011, 0.68±0.006), (0.93±0.016, 1.15±0.252, 0.43±0.011, 0.55±0.012) and (0.84±0.014, 1.03±0.012, 1.27±0.037) respectively. The present findings in respect of body size and antennal length of different nymphal instars are in agreement with that of Behura *et al.* (1976), who also observed body size and antennal length of the 1st, 2nd, 3rd and 4th instar nymphs as 0.73x0.43, 1.17x0.69, 1.23x0.71 and 1.46x0.96 mm, and 0.38, 0.56, 0.73 and 0.85 mm

Table 1. Morphometrics of different stages of *Aphis pomi*

Stages	BODY Length of Antenna (mm)					
	Length (mm)			Breadth (mm)		
	Range	Average	Range	Average	Range	Average
I	0.56-0.76	0.72±0.02	0.28-0.33	0.33±0.01	0.34-0.41	0.38±0.007
II	0.85-1.00	0.92±0.01	0.39-0.59	0.49±0.02	0.38-0.61	0.49±0.032
III	0.95-1.27	1.05±0.03	0.54-0.76	0.64±0.02	0.49-0.68	0.60±0.025
IV	1.00-1.60	1.21±0.05	0.61-0.91	0.78±0.03	0.79-0.96	0.85±0.021
Adult	1.12-1.72	1.52±0.07	0.74-1.33	1.02±0.21	1.12-1.91	1.44±0.099

Table 2. Morphometry of legs in different stages of *Aphis pomi*

Stages	Length of Legs (mm)					
	Fore Leg		Mid Leg		Hind Leg	
	Mean±SE	Range	Mean±SE	Range	Mean±SE	Range
I Instar	0.38±0.014	0.36-0.40	0.39±0.016	0.38-0.42	0.43±0.011	0.39-0.48
II Instar	0.39±0.009	0.36-0.44	0.45±0.011	0.40-0.49	0.55±0.012	0.48-0.58
III Instar	0.58±0.008	0.55-0.63	0.68±0.006	0.65-0.71	0.84±0.014	0.76-0.89
IV Instar	0.87±0.016	0.79-0.93	0.93±0.016	0.86-0.99	1.03±0.012	0.98-1.07
Adult	1.04±0.012	0.99-1.08	1.15±0.252	1.08-1.30	1.27±0.037	1.00-1.42

respectively. Our results are also in agreement with Anjali *et al.* (2017) who observed length and breadth of 1st, 2nd, 3rd, 4th nymphal and adult stage of corn leaf aphid, *Rhopalosiphum maidis* as 0.72×0.30, 0.97×0.41, 1.39×0.58, 1.73×0.73 and 1.83×0.78 mm respectively. Our studies are also in accordance with Devi and Singh (2007) who reported gradual developmental changes from first instar to adult phase in green peach aphid.

CONCLUSION

This study focused on the morphometry of the green apple aphid (*Aphis pomi*), an important pest in apple orchards in Kashmir. The morphometric analysis revealed gradual developmental variations in size, shape, color, and other characteristics from the first instar to the adult stage. The body length and width of different nymphal stages were measured, providing valuable data for the identification and management of this pest.

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