

Comparative structure and morphometry of body of different aphids on various fruit crops in Punjab

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ABSTRACT

Six aphid species have been studied for their proportion and morphometry, especially on different fruit crops like citrus, peach and pear in Punjab using Scanning Electron Microscope. In fourth nymphal instar and alate adult, body length was the maximum in *M. persicae* (2.04 ± 0.03 mm) on peach followed by on citrus during spring season. The minimum body length of nymph was observed in *B. helichrysi* (1.37 ± 0.03 mm) while that of alate in *A. gossypii*.

Keywords : Aphid, alate, fruit crops, nymph, species

Aphids (Hemiptera: Aphididae) are truly interesting group of phytophagous insects because of their polyphenism, host alternation between woody and herbaceous angiosperms; few species live on conifers and ferns but the majority of them are found on higher angiosperms (Blackman and Eastop, 1984) with heterocious behaviour and reproductive habits (rapid increase of population through parthenogenesis). Due to morphometric variability, some structures considered of diagnostic value in the description of new species (Ghosh, 1974). A detailed knowledge of correct morphology and other kind of variations among the insects is essential for proper identification and classification. About 300 species of aphids are vectors of more than 300 different viruses (Eastop and Lambers, 1976), so aphids are regarded as one of the most important groups of agricultural pests. About eight aphid species (Sharma and Singh 2012, a, b) have been reported on different fruit crops in Punjab, but their proportion and morphometry especially on citrus, peach and pear are wanting. Therefore, the present study was undertaken to elucidate these aspects.

MATERIAL AND METHODS

The studies on the body morphometry of six aphid species, viz. *Toxoptera aurantii* (Boyer de Fonscolombe), *Aphis gossypii* Glover, *Myzus persicae* (Sulzer), *Brachycaudus helichrysi* (Kaltenbach), *Schizaphis* spp. and *Toxoptera* spp. on three fruit crops namely citrus, peach and pear were conducted in the College Orchard/Fruit Research Farm, Punjab Agricultural University, Ludhiana during 2014-15. Measurements of body length and width were recorded by using ocular and stage micrometer fitted on an Olympus SZ 40 stereo zoom microscope (4X). Morphometry of ten slides of 4th nymphal instar and alate adult were recorded in micrometer under optical

microscope (Zeiss-Axioskop 40 with AxioCam Camera and Axiovision software). Photographs were taken with a Leica camera attached on a Leica MZ 16A stereo zoom microscope (157.5X) and also imaged under S-3400N Scanning Electron Microscope (SEM). For comparison of means of different parameters of various species, critical difference was also calculated separately for nymphs and alate adults by applying completely randomized block design using software CPCS-1.

RESULTS AND DISCUSSION

Fourth instar nymph: The mean body length and width (mm) of different aphid species was recorded on leaves and flowers of various fruit plants during 2014-15 (Table 1). It is clearly evident that *M. persicae* on peach had maximum body length (2.04 ± 0.03 mm) during spring season followed by *M. persicae* (1.97 ± 0.02 mm) on citrus and *T. aurantii* (1.91 ± 0.03 mm). The body size (1.62-2.10 mm long and 0.82-1.04 mm wide) of *M. persicae* reported by Najjar-Rodríguez, 2007, was at variation to present study but almost similar results were reported by Blackman and Eastop 1984; Ghosh 1974 and Hill 2008. The mean body length of *S. piricola* (1.75 ± 0.02 mm) and *Toxoptera* spp. (1.73 ± 0.02 mm) in pear were statistically *on par* during spring season. While autumn population of *M. persicae* on citrus (1.72 ± 0.04 mm) was significantly different with that of spring population in terms of body length. It was also found that the mean body length and width of *T. aurantii* (1.62 ± 0.03 , 0.87 ± 0.03 mm, respectively) during autumn season was significantly less than spring population in citrus. This observation in the present study was similar as also reported by Blackman and Eastop 1984; Hill 2008 and Hidalgo and Mifsud, 2011. However, the corresponding data on *A. gossypii* (1.50 ± 0.03 mm) during autumn season was significantly different to other aphid species but the body length and width as reported

Table 1: Body length and width (mm) of 4th instar nymph of different aphid species on leaves and flowers of various fruit crops during 2014-15

| Aphid species | Host | Activity period | Measurement (mm)*(4X) ¹ | |
|----------------------------------|--------|-------------------|------------------------------------|-------------|
| | | | Length | Width |
| <i>B. helichrysi</i> | Peach | February-April | 1.37 ± 0.03 | 0.90 ± 0.02 |
| <i>M. persicae</i> | Peach | February- April | 2.04 ± 0.03 | 0.92 ± 0.04 |
| <i>M. persicae</i> | Citrus | February- April | 1.97 ± 0.02 | 0.88 ± 0.02 |
| <i>M. persicae</i> | Citrus | September-October | 1.72 ± 0.04 | 0.74 ± 0.04 |
| <i>A. gossypii</i> | Citrus | September-October | 1.50 ± 0.03 | 0.81 ± 0.02 |
| <i>T. aurantii</i> | Citrus | September-October | 1.62 ± 0.03 | 0.87 ± 0.03 |
| <i>T. aurantii</i> | Citrus | February- April | 1.91 ± 0.03 | 1.04 ± 0.02 |
| <i>Toxoptera</i> spp.** | Pear | February-April | 1.73 ± 0.02 | 0.98 ± 0.01 |
| <i>S. piricola</i> ^{??} | Pear | February-April | 1.75 ± 0.02 | 1.03 ± 0.02 |
| LSD(0.05) | | | 0.08 | 0.07 |

Table 2: Body length and width (mm) of alate adults of different aphid species on leaves of various fruit crops during 2014-15

| Aphid species | Host | Activity period | Measurement (mm)*(4X) ¹ | |
|----------------------|--------|--------------------------|------------------------------------|-------------|
| | | | Length | Width |
| <i>B. helichrysi</i> | Peach | April | 1.52 ± 0.04 | 0.71 ± 0.02 |
| <i>M. persicae</i> | Peach | First fortnight of April | 1.80 ± 0.02 | 0.60 ± 0.01 |
| <i>M. persicae</i> | Citrus | First fortnight of April | 1.52 ± 0.03 | 0.56 ± 0.01 |
| <i>A. gossypii</i> | Citrus | October | 1.34 ± 0.03 | 0.61 ± 0.02 |
| LSD(0.05) | | | 0.09 | 0.04 |

*Mean of 10 specimens ± SE; ¹Magnification of objective on binocular microscope

by Usmani and Rafi, (2009) Blackman and Eastop, 1984 and Tasheva-Terzieva, 2008 was almost similar to the present findings. The minimum body length of *B. helichrysi* (1.37 ± 0.03 mm) in peach during spring season was statistically different to that of other species (Table 1). Blackman and Eastop, (1984) and Ghosh, (1974) reported the size of *B. helichrysi* in apterae as 0.9-2.0 mm and that of alate 1.1-2.2 mm. Similarly, spring population of *T. aurantii* had the maximum body width (1.04 ± 0.02 mm) which was statistically on par with *S. piricola* (1.03 ± 0.02 mm). But different results of body length of *S. piricola* were reported by Hidalgo and Mifsud (2011) and Ghosh (1974) which could be due to environmental and host factors as well as resolution of microscope. The corresponding data of *Toxoptera* spp. (0.98 ± 0.01 mm) was significantly different from other aphid species, but the width of *B. helichrysi* and *M. persicae* on peach were statistically on par with each other (0.90 ± 0.02 and 0.92 ± 0.04 mm, respectively). It was also found that the width of *M. persicae* on peach and citrus during spring season was non-significant (0.92 ± 0.04 and 0.88 ± 0.02 mm, respectively). However, the mean body width of *A.*

gossypii (0.81 ± 0.02 mm) was statistically on par with *T. aurantii* (0.87 ± 0.03 mm) during autumn season. The minimum body width of *M. persicae* on citrus during autumn season was significantly less than that during spring population. The results indicated that the size of *M. persicae* was the maximum followed by *T. aurantii* whereas the size of *B. helichrysi* was the smallest of all the species.

Alate adult: Body length and width (mm) of alate adults of different aphid species on leaves of various fruit plants during 2014-15 (Table 2) revealed that maximum body length (1.80 ± 0.02 mm) in *M. persicae* was found on peach followed by *B. helichrysi* (1.52 ± 0.04 mm) which was statistically at par with *M. persicae* on citrus (1.52 ± 0.03 mm). Similar results were also reported by Najar-Rodríguez (2007) that *M. persicae* alate had longer length and lesser width (1.78-2.18 x 0.85-0.98 mm). The smallest body length was observed in *A. gossypii* (1.34 ± 0.03 mm) which was significantly different to that of *B. helichrysi* and *M. persicae*. Similarly, *B. helichrysi* had maximum body width (0.71 ± 0.02 mm) followed by *A. gossypii* (0.61 ± 0.02 mm) which was on par with *M. persicae* on peach (0.60 ±

0.01 mm). The body length and width of *M. persicae* on peach was more than that on citrus could be due to the host suitability.

It is concluded that six aphid species were active on peach, citrus and pear but alate adults were found in only three species. No alate form was observed in *T. aurantii*, *Toxoptera* spp. and *S. piricola*. *Toxoptera* spp. on pear could be a different species to that on citrus while *Schizaphis piricola* is a new species on pears in Punjab. Maximum body length was observed in both nymph and alate adult of *M. persicae* in peach. The minimum body length of nymph was observed in *B. helichrysi* while that of alate in *A. gossypii*.

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