CHROMOSOME STUDIES AND BIOLOGICAL NOTES ON *APHIS CITRICOLA* (=*SPIRAECOLA*) AND *GREENIDEA FICICOLA* FROM HIMACHAL PRADESH

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SUMMARY

Chromosomes of 2 species of aphids namely, *Aphis citricola* van der Goot infesting nectarine and *Greenidea ficicola* Takahashi infesting guava plants were studied. Biological notes on these species were also recorded. In both these species, only parthenogenetic generations were recorded. Total life period of *A. citricola* and *G. ficicola* was found to be 23 to 29.5 d and 22 to 27 d respectively. Diploid chromosome number in *A. citricola* was found to be 8 and in *G. ficicola* 2n was found to be 22. Actual lengths of chromosomes were measured at metaphase and total complement length as well as relative length of chromosomes were calculated.

*Keywords:* Aphid, chromosomes, karyotype.

Aphids (Sternorrhyncha: Aphididae) are exclusive phloem feeders and soft bodied insects that have worldwide distribution. There are about 4500 described aphid species worldwide. Of these, about 250 are serious pests of crops and cause great losses of yield (Blackman & Eastop 2006, Remaudière & Remaudière 1997). These insects are unique in having various unusual phenomena in their life cycle such as viviparity, telescoping of generations, cyclic parthenogenesis, occurrence of holocyclic and anholocyclic life cycles, occurrence of monophagous or polyphagous species, polymorphism and small size of holocentric chromosomes (Dixon 1973, Gautam et al. 1993).

Aphids are economically very important pests causing great damage by curling leaves, transmitting viruses and adversely affecting fruit quality. *Aphis citricola* is a highly polyphagous pest and also transmits a number of viruses such as plum pox virus, zucchini yellow mosaic virus and tristeza virus (Blackman & Eastop 1984). Biology of *Greenidea ficicola* is very poorly known though it causes considerable damage to host plants, thus the studies on biology and chromosomes of such species of aphids are important in order to understand their host plant association as well as the adaptive trends.
Aphids were collected from Aut, Mandi district, during July—August 2014. They were found infesting tender shoots, lower side of leaves, soft parts of branches of their respective host plants. *A. citriola* was collected from its host *Prunus persica* and *G. ficicola* was collected from its host plant *Psidium guajava*. Keys developed by Blackman & Eastop (1984) were used for identification of aphid species.

Biological notes were recorded on these aphid species by maintaining the cultures under laboratory conditions on plants grown in clay pots during September–October, 2014. Maximum and minimum temperatures recorded during this period were 24.54°C and 13.72°C respectively. Adult apterous, parthenogenetic and viviparous females were taken from the host plants in fields and transferred to young host plants grown in clay pots to obtain the young nymphs. These nymphs were then transferred to their respective host plants and various developmental stages were studied. All the developmental stages were kept under observations throughout their life and data on duration of different stages of life cycle were noted down.

Chromosomal preparations were made from somatic embryonic tissues. Embryos were obtained by puncturing posterior end of the abdomen of an adult parthenogenetic female and were pretreated with 0.7% sodium citrate solution for 30 min. Pretreated embryos were fixed in 1:3 acetic-ethanol solution for 15–20 min at room temperature. After fixation, they were treated with few drops of 45% glacial acetic acid for 3–5 min. A cover slip was placed above the material with an edge extending outside the slide. Slide was placed between the folds of blotting paper and tapped gently with blunt end of forceps. Cover slip was dislodged of with sudden jerk with the help of a sharp razor blade. Slides and cover slips both were dried in a dust free chamber. Staining was done in 2% Giemsa for 20 to 30 min. Slides were made permanent by dipping in xylene and mounting in DPX.

Chromosome slides were observed under research binocular microscope and photomicrographs were taken. Actual lengths of chromosomes were measured using ocular micrometer. From actual lengths, total complement length and relative length were calculated.

*A. citricola*

Aphids of this species are light green and occur on young shoots and on both surfaces of leaves but lower surface is infested heavily (Fig. 1). Its parthenogenetic life cycle consisted of 4 regular moults resulting in 5 instars. The total life period was of 23 to 29.5 d (mean 26.1 d ± 0.61 S.E.) (Table 1). The biology of this aphid species was reported from different geographic regions by many workers (De Menezes 1970, Komazaki et al. 1979, Komazaki 1983, Kranz et al. 1977, Zehavi & Rosen 1987). Andreev et al. (2009) and De Menezes (1970) studied the holocyclic life cycle of this aphid from North America where *Spiraea* is the primary host. Life cycle of this...
Aphid was studied in Japan by Komazaki (1983) where both Spiraea and Citrus serve as primary hosts. Secondary hosts of this aphid belong to different families like Rosaceae, Caprifoliaceae, Compositae, Rubiaceae etc.

**TABLE 1:** Pre-reproductive, reproductive, post-reproductive and total life period of *A. citricola* and *G. ficicola* during September-October.

<table>
<thead>
<tr>
<th>Aphid species</th>
<th>Pre-reproductive period (in d)</th>
<th>Reproductive period (in d)</th>
<th>Post-reproductive period (in d)</th>
<th>Total life period (in d)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. citricola</em></td>
<td>13.3 ± 0.30</td>
<td>10.4 ± 0.71</td>
<td>2.4 ± 0.14</td>
<td>26.1 ± 0.61</td>
</tr>
<tr>
<td><em>G. ficicola</em></td>
<td>13.1 ± 0.50</td>
<td>9.1 ± 0.79</td>
<td>2.4 ± 0.14</td>
<td>24.6 ± 0.60</td>
</tr>
</tbody>
</table>

The diploid chromosome number in *A. citricola* was found to be 8 (Figs 3, 4). Same chromosome number was reported in this species by Blackman & Eastop (1984). The length of chromosomes ranged from 1.62 µm ± 0.08 S.E. to 3.47 µm ± 0.25 S.E. The total complement length was 20.76 µm ± 1.35 S.E. The relative length of chromosomes ranged from 8.02 ± 0.46 S.E. to 16.7 ± 0.4 S.E. Idiogram showed gradual decrease in the length of chromosomes (Fig. 5).

*G. ficicola*

Aphids of this species are dark brown and occur on young shoots and twigs of guava (Fig. 2). Its parthenogenetic phase consists of 4 regular moults resulting in 5 instars. Total life period ranged from 22 to 27 d (mean 24.6 d ± 0.6 S.E.) (Table 1). The biology of species of *G. ficicola* on guava and other host plants from other regions is not known. This species is probably anholocyclic as no sexual morphs have been recorded yet (Blackman & Eastop 1984, Halbert 2004, Noemberg-Lazzari et al. 2006, Sousa-Silva et al. 2005).

The diploid chromosome number in *G. ficicola* was found to be 22 (Figs 6, 7). Same chromosome number was reported by Blackman & Eastop (1984). The length of chromosomes ranged from 0.6 µm ± 0.06 S.E. to 2.41 µm ± 0.11 S.E. The total complement length was 31.1 µm ± 0.82 S.E. The relative length of chromosomes ranged from 1.93 ± 0.19 S.E. to 7.74 ± 0.28 S.E. Idiogram showed a gradual decrease in the length of chromosomes (Fig. 8).

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