



Study of the Chromosome of Aphids of Family Rosaceae

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ABSTRACT: Hamirpur district is the smallest district of Himachal Pradesh. This region act as good hot spot for the diverse flora and fauna. This region is fall of horticulture and agricultural plant varieties of economic interest with in the prosperity related to the horticulture and agricultural field, there is occurrence of some damage causing pests. Among these pests, aphids are prominent in this region. So this paper reveals the chromosomal study of four aphids of plant species of rosaceae family.

Key words: Aphids, Chromosome, Horticulture, Pest, Hamirpur.

INTRODUCTION

Aphids are tiny insect pests. They are of great economic importance. They are the damage causing pests to our horticultural and agricultural crops. They cause damage to the plants by sucking their sap and also transmit the viral diseases. The aphid life cycle shows some characteristic features like cyclic parthenogenesis, viviparity and polymorphism because of these phenomenon the aphids can multiply with a high rate and thus they build a large population in a very less time (Dixon 1985).

Cytological mechanism in aphids is somewhat typical but of great interest due to holocentric nature of chromosome. Type in aphids sex is of XX-XO type. Sex determination in the aphids is determined on the basis of behavior of the sex chromosomes in the oocyte which is developing. The phenomenon of spermatogenesis in the aphids starts is during the developmental stages. But it is completed before the aphids become adult. Pre-reductional and post reductional meiotic divisions reported in aphids is difficult because of its holocentric chromosomes (Gautam et al., 1993). Aphid fauna of H.P have been taxonomically described by Ghosh (1986). He reported the occurrence of 186 species. Cytological studies on the aphid fauna of H.P was carried by several workers (Kulkarni and Kacker, 1980, 1981; Gautum and Verma, 1982, 1983; Kurla and Chauhan 1986,1983; Gautum and Sharma 1990; Dulta and Gautum 1993; Kapoor and Gautum, 1994; Gautum and Dulta, 1994). All these workers reported the chromosome of aphids.

MATERIAL METHODS

The field survey were carried out in the rural areas of Hamirpur district for the collected from twigs, leaves, stem and inflorescence on which the infestation had occurred were cut out and collected in small plastic bags for the identification of aphid species, the whole mounts were prepared according to the method of Blackman and Eastop (1984) of aphids were also made for identification of species. After identification cytological studies was done. For this purpose embryos were taken out by puncturing the posterior end of parthenogenetic aphids. Only young embryo in which there was no eye colour pigment were taken for preparation of chromosome slide.

Embryos were pretreated in 0.7% sodium literate solution for 30minutes and they were mixed 1:3acetic ethanol for 10-15 min. squashing of embryos were done by putting them on glass slide with a drop of 50%acetic acid by 3-5 min and cover slip was placed with liable edge extending outward. Then the slide was pressed with thumb. The cover slip were dislodged off the slide with sudden jerk. Slides and cover slips were dried at room temperature in a dust free temperature. After this staining was done with 2% Giemsa solution. After staining slides and cover slips were placed in working solution for 30min and excess of stain was removed and they are dried again. Permanent slides were made and dried in oven at 60°C. Permanent slides were observed and photomicrograph of best plates were taken.

Study area: Hamirpur district is situated between 76°18',-76°44' east longitudes and 31°52', 30" north longitudes. This region is hilly and falls in the shivalik range. This region is rich in diverse and fauna which makes it suitable ethanobotanical exploration and zoological study.

RESULTS AND OBSERVATIONS

In the present study the chromosome of four aphid species which have been collected from plant species of Rosaceae family of Hamirpur district have been investigated. The diploid chromosome number (2n) of these aphid species are given below:

Table 1.

Sr. No.	Name of aphid species	Host plant species	No of chromosome (2n)
1.	<i>Brachtaudus helichrysi</i> (Kaltenbach)	<i>Prunus domestica</i> Linn.	2n = 12
2.	<i>Macrosorum pallidum</i> (Oestlund)	<i>Rosa sp.</i>	2n = 10
3.	<i>Macrosiphum rosae</i> (L.)	<i>Rosa sp.</i>	2N = 10
4.	<i>Taxoptera aurantii</i> (Boyer defonsceolombe)	<i>Pyrus malus</i> Linn.	2n = 8

1. *Brachtaudus helichrysi* (Kaltenbach). This aphid species was collected from the leaves of *Prunus domestica* which is locally known in study region as "Aloe Bhukhara" or plum. In this Aphid species

chromosome number (2n) is 12. The actual length of somatic metaphase chromosome of Aphid species *Brachtaudus helichrysi* shown in Table 2:

Table 2: Actual lengths as percentage of total complement of somatic chromosomes of *Brachtaudus helichrysi*.

Somatic meta-phase plate	Chromosome Length											Total comple ment lenth	
	Chromosome number												
	1	2	3	4	5	6	7	8	9	10	11		
	12												
1	5.27	5.27	4.49	4.49	3.56	3.56	3.25	3.25	2.32	2.32	2.17	2.17	42.12
2	5.42	5.42	4.34	4.34	3.72	3.72	3.25	3.25	2.48	2.48	2.01	2.01	42.44
3	5.34	5.34	4.34	3.56	3.56	3.56	3.25	3.25	2.48	2.48	2.01	2.01	41.96
4	5.27	5.27	4.34	3.56	3.56	3.56	3.10	3.10	2.32	2.32	1.86	1.86	41.90
5	12.70	12.70	10.63	10.63	8.78	8.78	7.64	7.64	5.59	5.59	4.65	4.65	41.48
6	13.12	13.12	10.27	10.27	8.75	8.75	7.79	7.79	5.33	5.33	4.74	4.74	40.70
7	12.82	12.82	10.03	10.03	8.93	8.93	8.19	8.19	5.57	5.57	4.46	4.46	41.66
8	12.74	12.74	10.82	10.82	8.10	8.10	7.73	7.73	5.59	5.59	5.01	5.01	40.10
9	11.74	11.74	11.17	11.17	8.34	8.34	8.14	8.14	5.31	5.31	5.31	5.31	40.90
10	12.16	12.16	10.59	10.59	8.81	8.81	8.23	8.23	5.50	5.50	4.71	4.71	39.48
Mean	12.62	12.62	10.54	10.54	8.61	8.61	7.84	7.84	5.58	5.58	4.81	4.81	41.17
SE*	0.12	0.12	0.1	0.1	0.08	0.08	0.08	0.06	0.06	0.08	0.08	0.08	0.29

*Standard error about the mean.

2. *Macrosorum pallidum*: This Aphid species was collected from the leaves of *Rosa* species colour of this Aphid is green. The diploid chromosome number of

this Aphid is 10. The actual length of the shortest and longest is given in Table 3.

Table 3: Actual length of somatic metaphase chromosome of *Macrosporum pallidum*.

Chromosome Length											
Somatic Metaohase total Plate complement Total length	Chromosome number										
	1	2	3	4	5	6	7	8	9	10	
1	2.34	2.34	1.75	1.75	1.75	1.75	1.61	1.61	0.58	0.58	16.06
2	2.63	2.63	1.75	1.75	1.31	1.31	1.71	1.71	0.58	0.58	14.88
3	2.92	2.92	2.34	2.34	1.75	1.75	0.88	0.88	0.58	0.58	16.94
4	2.78	2.78	2.34	2.34	2.1	2.1	1.75	1.75	1.46	1.46	21.04
5	2.34	2.34	2.34	2.34	1.75	1.75	1.46	1.46	0.58	0.58	17.04
6	2.04	2.04	1.75	1.75	1.75	1.75	0.58	0.58	0.58	0.58	13.4
7	1.46	1.46	1.17	1.17	1.17	1.17	0.88	0.88	0.58	0.58	10.52
8	2.34	2.34	2.04	2.04	1.75	1.75	1.17	1.17	1.17	1.17	16.94
9	2.92	2.92	2.92	2.92	1.75	1.75	1.75	1.75	0.88	0.88	20.44
10	3.21	3.21	1.75	1.75	1.46	1.46	1.17	1.17	1.02	1.02	17.22
Mean	2.50	2.50	2.01	2.01	1.66	1.66	1.24	1.24	0.80	0.80	16.45
SE*	0.16	0.16	0.15	0.15	0.09	0.09	0.12	0.12	0.10	0.10	0.97

*Standard error about the mean

3. *Microsiphium rosae*: This aphid species was collected from the leaves and buds of Rosa species. The diploid chromosome number of this aphid is 10.

The actual length of shortest and longest chromosome are given in Table 4.

Table 4: Actual length of somatic metaphase chromosome of *Macrosiphium rosae*.

Chromosome Length in Microns											
Somatic Metaphase Plate	Chromosome Number										Total complement length
	1	2	3	4	5	6	7	8	9	10	
1	3.41	3.41	2.63	2.63	2.01	2.01	1.55	1.55	1.08	1.08	21.36
2	3.25	3.25	2.79	2.79	1.86	1.86	1.55	1.55	0.93	0.93	20.76
3	3.10	3.10	2.63	2.63	2.01	2.01	1.55	1.55	1.08	1.08	20.74
4	3.41	3.41	2.79	2.79	1.86	1.86	1.39	1.39	1.16	1.16	21.22
5	3.56	3.56	2.63	2.63	2.09	2.09	1.39	1.39	1.00	1.00	21.34
6	3.41	3.41	2.79	2.79	1.99	1.99	1.70	1.70	1.22	1.22	22.22
7	3.41	3.41	2.79	2.79	2.01	2.01	1.70	1.70	0.93	0.93	21.68
8	3.56	3.56	2.32	2.32	2.01	2.01	1.55	1.55	1.08	1.08	21.04
9	3.25	3.25	2.32	2.32	1.86	1.86	1.55	1.55	1.08	1.08	20.12
10	3.10	3.10	2.63	2.63	1.99	1.99	1.39	1.39	1.16	1.16	20.54
Mean	3.35	3.35	2.63	2.63	1.97	1.97	1.53	1.53	1.07	1.07	21.1
SE*	0.05	0.05	0.05	0.05	0.02	0.02	0.03	0.03	0.03	0.03	0.19

*Standard error about mean

4. *Toxoptera aurantii* ($2n = 8$): was collected from the leaves Pyrus malus which is commonly know as Nashpati nack in Hamirpur.

The diploid chromosome number of this Aphid is ($2n = 8$). The actual length of shortest and longest chromosome is given in Table 5.

Table 5: Actual length of somatic metaphase chromosomes of *Taxoptera aurantii*.

Chromosome length in microns									
Somatic metaphase plate	Chromosome number						Total complement length		
	1	2	3	4	5	6	7	8	
1	3.12	3.12	2.40	2.40	1.84	1.84	1.52	1.52	17.76
2	3.28	3.28	2.56	2.56	1.92	1.92	1.36	1.36	18.24
3	3.4	3.4	2.60	2.60	1.84	1.84	1.60	1.60	18.88
4	3.28	3.28	2.64	2.64	1.92	1.92	1.54	1.54	18.76
5	3.28	3.28	2.48	2.48	1.80	1.80	1.40	1.40	17.92
6	3.12	3.12	2.64	2.64	1.80	1.80	1.44	1.44	18.00
7	3.4	3.4	2.56	2.56	1.92	1.92	1.64	1.64	19.04
8	3.2	3.2	2.40	2.40	1.76	1.76	1.60	1.60	17.92
9	3.28	3.28	2.40	2.40	1.84	1.84	1.54	1.54	18.12
10	3.12	3.12	2.64	2.64	1.80	1.80	1.80	1.80	18.32
Mean	3.25	3.25	2.53	2.53	1.84	1.84	1.52	1.52	18.30
SE*	0.11	0.11	0.10	0.10	0.06	0.06	0.90	0.90	0.45

*Standard error about mean

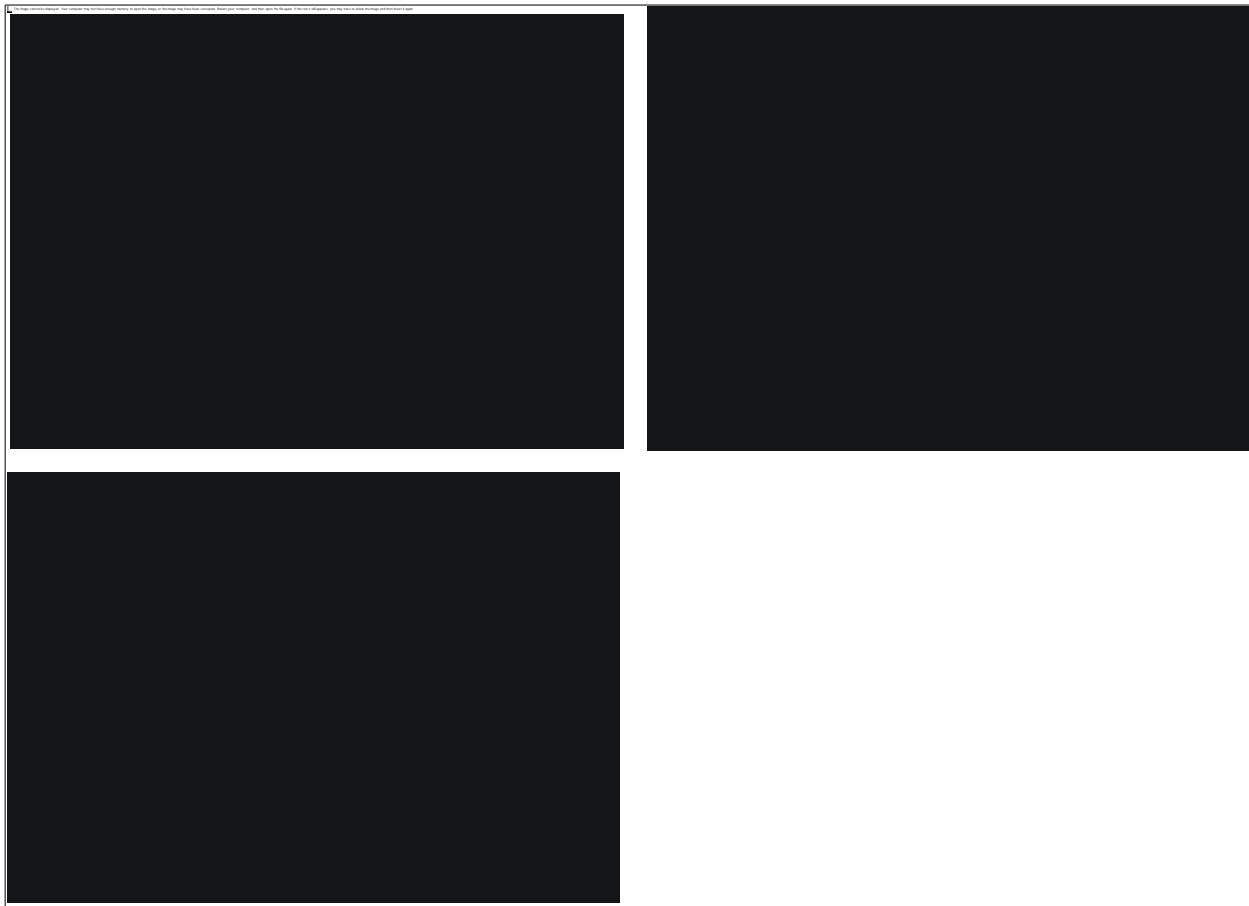
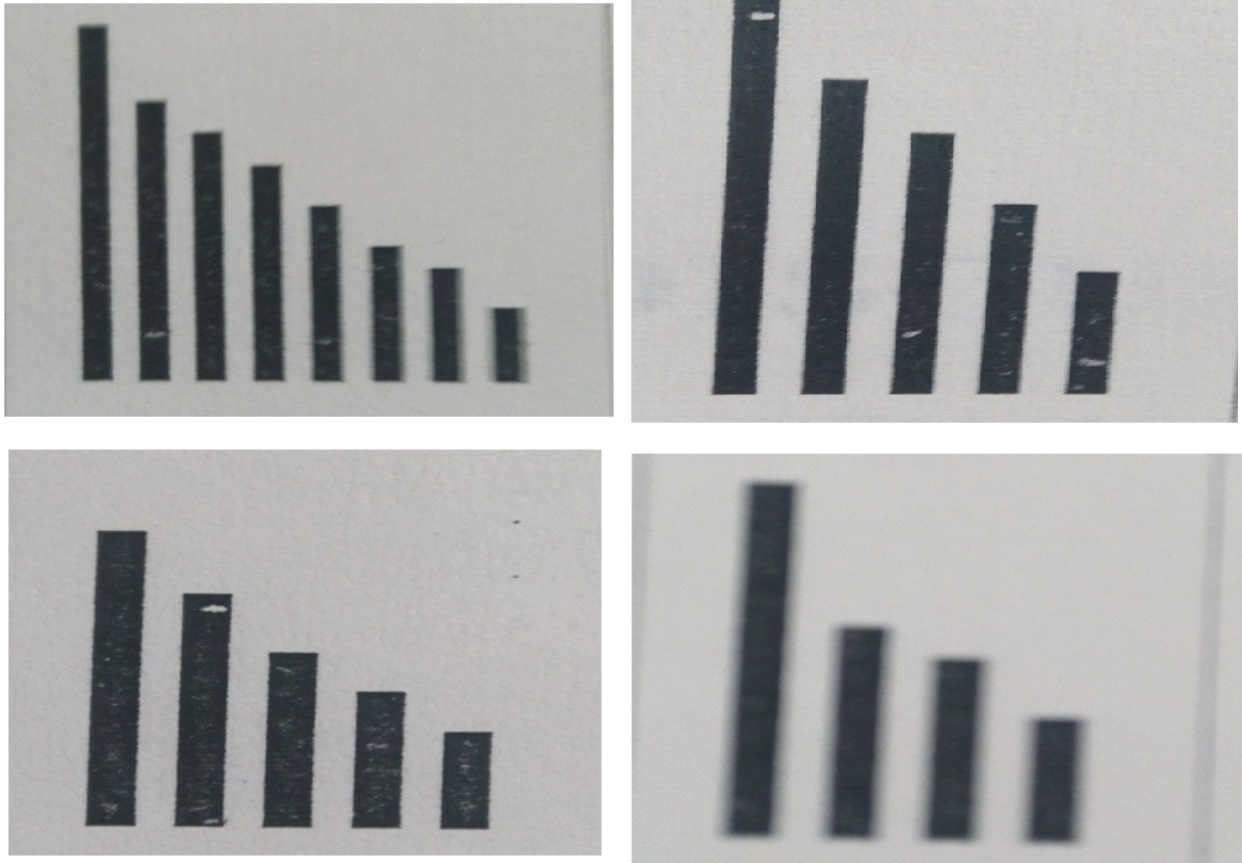


Plate of aphids of Rosaceae family.



Idiogram: 1, 2, 3, 4.

DISCUSSION

In the present study, chromosome of 4 species of aphids of Rosaceae family were investigated. It is found (from the Table 2) that the actual length of shortest and longest chromosome of aphid *Brachycaudus helichrysi* were $3.23\mu\text{m} \pm 0.03$ and $5.20\mu\text{m} \pm 0.07$ respectively. The total complement length $41.77\mu\text{m} \pm 0.03$ relative length range from 4.81 ± 0.08 in the shortest chromosome and 12.62 ± 0.12 in the longest chromosome. Idiogram of this aphid revealed that one pair of chromosome is long, three pairs are medium, two pairs are short. It is found that (Table 3) the actual length of shortest and longest chromosome of *Macrosorum pallidum* is $0.80\mu\text{m} \pm 0.10$ and 2.50 ± 0.16 respectively. The total complement length is $16.45\mu\text{m} \pm 0.97$ and relative length of shortest and longest chromosome are 4.84 ± 0.44 and 15.23 ± 0.60 respectively. Idiogram of this aphid species show one pair of long, three pairs of medium, one pair of short chromosome. It has been observed (Table 4) that the actual length shortest and longest chromosome *Macrosiphum rosae* is $1.07\mu\text{m} \pm 0.03$ and $3.35\mu\text{m}$

± 0.05 and the total complement length $21.1\mu\text{m} \pm 0.19$. The relative length of shortest and longest chromosome vary from 5.08 ± 0.15 and 15.86 ± 0.20 . The idiogram of this aphid shows 1 pair of long chromosome, three pairs of medium, one pair of short chromosome. *Taxopteri aurantii* species was collected from leaves of *Pyrus malus*. It has been observed (Table 5) that the actual length of shortest and longest chromosome is $1.56\mu\text{m} \pm 0.90$ and $3.25\mu\text{m} \pm 0.11$ respectively. The total complement length $18.30\mu\text{m} \pm 0.45$. The relative length of shortest chromosome is 8.50 ± 0.11 and that longest chromosome 17.58 ± 0.31 . The idiogram shows one pair of long chromosome, two pair of medium sized, one pair of short chromosome.

CONCLUSION

From this study, it has been concluded that the Aphid chromosome shows many variations. This study may help in determining the adaptability of Aphid species occurring in the common plants. And it also helps in ascertaining the evolution of their karyotypes.

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