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CHROMOSOMES OF SEVEN SPECIES OF APHIDS (HOMOPTERA : APHIDIDAE)

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ABSTRACT

Somatic chromosomes from the embryos of apterous viviparous females of seven species of aphids were studied viz. *Sinomegoura citricola* V. d. Goot 2n=12 ; *Macrosiphum yamagopholiae* (Shinji) 2n=12 ; *M. rosae* (L) 2n=12 ; *Eriosoma lanigerum* Hausmann 2n=12 ; *Brevicoryne brassicae* (L) 2n=14 ; *Geoicea lucifaga* Zehn. 2n=14 and *Tetraneura nigriabdominalis* Sasaki 2n=14. Morphometric analysis of their individual chromosome pairs was carried out and karyotypes for these species were constructed.

Studies on the chromosomes of Indian species of aphids have been taken up in recent years. As a result, information on the chromosomes of nearly seventy species of aphids is available (Kulkarni 1982). However, detailed studies on chromosome morphology and karyotypes are available in twentyfive species of aphids. In rest of the species only the diploid chromosome numbers and probable sex-determining mechanisms are discussed.

The present paper deals with the chromosomes of seven species of aphids viz. *Sinomegoura citricola* v. d. Goot ; *Macrosiphum yamagopholiae* (Shinji) ; *M. rosae* (L); *Eriosoma lanigerum* Hausmann ; *Brevicoryne brassicae* (L) ; *Geoicea lucifaga* Zehn. and *Tetraneura nigriabdominalis* Sasaki.

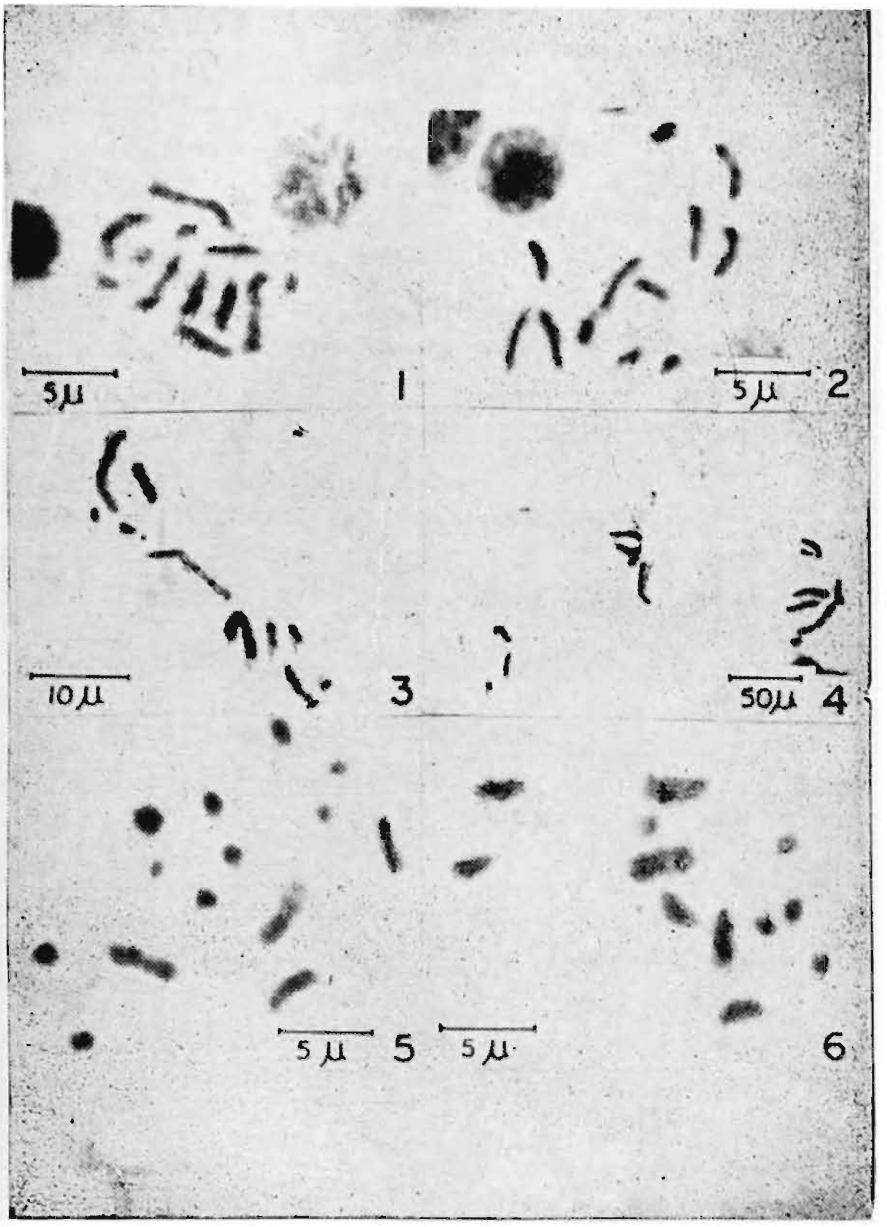
MATERIALS AND METHODS

Apterous viviparous females of aphids were collected and their embryos were used for the study of somatic chromosomes. Collection data for these species are given in Table 1. The technique employed in the cytological preparations was similar to that described earlier (Kulkarni and Kacker 1981). Several metaphase plates were scanned under the microscope and the karyotype was prepared based on the measurements of a minimum of ten well spread metaphase plates.

1. *Sinomegoura citricola* V. d. Goot. : The diploid chromosome number in this species was observed to be 12 (Plate XI.6). Studies on the relative percentage lengths of individual chromosome pairs of this species have shown that there is a gradual reduction in their size. One pair appeared to be heteromorphic and was placed fourth within the complement (Plate XII. D). Its individual chromosomes measured 10.42% and 15.70% of the total complement. Occurrence of heteromorphic chromosome pairs has also been reported earlier in some other species of aphids (Kulkarni and Kacker 1980, Blackman 1980).

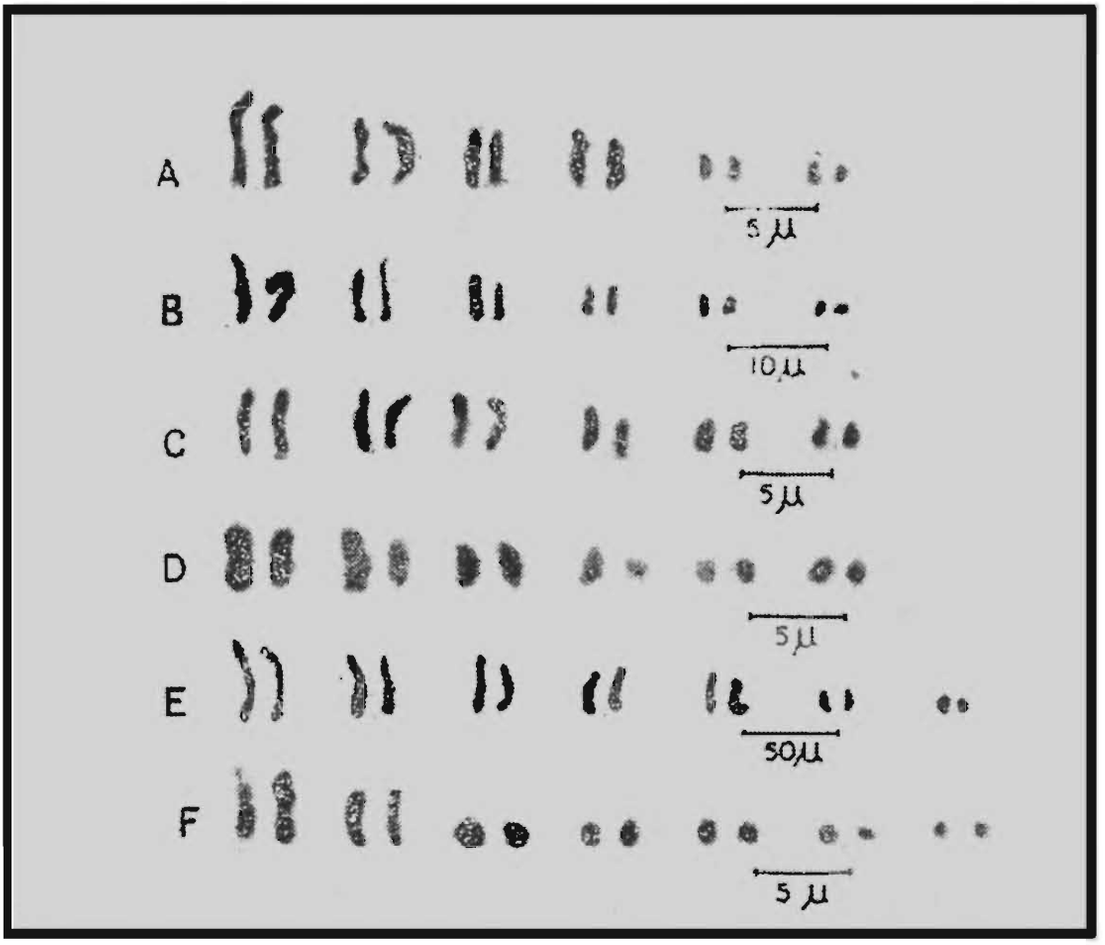
2. *Macrosiphum yamagopholiae* (Shinji) : 2n number in this species was observed to be 12 (Plate XI.1). The morphometric ana-

KULKARNI PLATE XI



Figs. 1-6. 1. *Macrosiphum yamagopholiae* (Shinji) 2n = 12
2. *Eriosoma lanigerum* Hausmann 2n = 12
3. *Macrosiphum rosae* (L) 2n = 12
4. *Geoicea lucifaga* Zehn. 2n = 14
5. *Brevicoryne brassicae* (L) 2n = 14
6. *Sinomegoura citricola* (V. d. Goot) 2n = 12

KULKARNI PLATE XII



Karyotypes :

Figs. A-F.
- A. *Macrosiphum yamagopholiae* (Shinji)
- B. *Macrosiphum rosae* (L)
- C. *Eriosoma lanigerum* Hausmann
- D. *Sinomegoura citricola* (V. d. Goot)
- E. *Geoicea lucifaga* Zehn.
- F. *Brevicoryne brassicae* (L)

lysis of the individual chromosome pairs has shown that the first pair measured 26.02% and the second pair to be 23.00% of the total complement. The third and the fourth pairs had a little difference, while the last two pairs were found almost equal in their percentage lengths (Table 2).

3. *Macrosiphum rosae* (L) : Diploid chromosome number in this species was found to be 12 (Plate XI.3) which is in agreement with that reported by Khuda Bukhsh 1980. The longest pair within the complement measured 31.37% of the total length. Second, third and fourth pairs reavealed considerable gaps in their relative percentage lengths, while the last two pairs had a narrow difference.

4. *Eriosoma lanigerum* Hausmann : The diploid chromosome number of this species was reported earlier (Kulkarni and Kacker 1980) to be 12. It was not possible to work out the morphometry of the chromosomes at that time due to insufficient number of suitable metaphase plates. Further studies on the species have enabled now to work out the morphometry as well as the construction of karyotype for it. The details of the percentage lengths of the individual chromosome pairs within the complement are given in table 2 and a karyotype has been constructed (Plate XII. C.).

5. *Brevicoryne brassicae* (L) : The diploid chromosome number in this species was found to be 14 (Plate XI.5). Studies on the morphometry of the individual chromosome pairs have shown that the first two pairs are considerably large, contributing more than

TABLE 1. Table showing the collection data of the aphid species.

Sr. No.	NAME OF THE SPECIES	HOST	DATE OF COLLECTION	LOCALITY
1.	*Sinomegoura citricola* (V. d. Goot)	Unidentified	20.2.1981	Darjeeling
2.	*Macrosiphum yamagopholiae* (Shinji)	Unidentified	1.11.1979	Kursiong, Darjeeling.
3.	*Macrosiphum rosas* (L)	Rosa ap.	3.11.1979	Tindharia, Darjeeling.
4.	*Eriosoma lanigerum* Hausmann	Apple roots	12.3.1979	Mashobra, Simla.
5.	*Brevicoryne brassicae* (L)	Unidentified	23.2.1981	Bijanbari, Darjeeling.
6.	*Geoicea lucifaga* Zehn.	Grass roots	5.11.1979	Dow Hill, Darjeeling.
7.	*Tetraneura nigriabdominalis* Sasaki	Grass roots	29.10.1979	Sukna, Darjeeling.

TABLE 2. Table showing the relative percentage lengths of the individual chromosome pairs.

Sr. No.	NAME OF THE SPECIES	CHROMOSOME PAIR Nos.						
		1	2	3	4	5	6	7
1.	*Sinomegoura citricola* (V. d. Goot)	22.53	17.49	14.18	15.70 10.42	10.49	8.62	
2.	*Macrosiphum yamagopholiae* (Shinji)	26.20	23.00	17.86	16.00	8.53	8.53	
3.	*Macrosiphum rosae* (L)	31.37	23.79	18.99	11.25	7.70	6.62	
4.	*Eriosoma lanigerum* Hausmann	27.75	19.77	19.02	13.92	11.48	9.91	
5.	*Brevicoryne brassicae* (L)	35.32	21.00	13.38	9.41	8.34	6.95	5.57
6.	*Geoicea lucifaga* Zehn.	25.22	17.97	16.74	14.28	10.26	7.81	6.69

half of the total length of the complement and measured 35.32% and 21.00% respectively. The rest of the pairs showed comparatively narrow difference between their percentage lengths (Table 2). Karyotype of this species is given in Plate XII. F.

6. *Geoicea lucifaga* Zehn. : 2n number in this species was observed to be 14 (Plate XI.4). Blackman 1980 has reported chromosome number for four other species of *Geoicea* to be ranging from 16 to 31. This species has shown lesser number of diploid chromosomes. The detailed morphometric analysis of the relative percentage lengths of the individual chromosome pairs of this species is given in Table 2. Karyotype for this species is also constructed (Plate XII. E).

7. *Tetraneura nigriabdominalis* Sasaki : 2n number in this species was observed to be 14. Kulkarni and Kacker 1980 have studied chromosomes of a congeneric species *Tetraneura hirsuta* Baker and observed similar diploid number for it. In the present paper, it was not possible to construct the karyotype and calculate the relative percentage lengths of the individual chromosome pairs for the species.

Discussion : Out of the seven species studied here, information on the diploid chromosome numbers was available for two species, *Macrosiphum rosae* (L) (Khuda Bukhsh 1980) and *Eriosoma lanigerum* Hausmann (Kulkarni and Kacker 1979), Sun and Robinson 1966). The present studies have shown no difference so far as the chromosome number is concerned. The detailed morphometric analysis of the individual chromosome pairs was not available earlier, which has been provided here, as well as the karyotypes for these species have been constructed.

In the case of *Geoicea lucifaga* Zehn. and *Tetraneura nigriabdominalis* Sasaki, information on some congeneric species was available (Blackman 1980 and Kulkarni and Kacker 1980).

As far as the studies on the rest of the species viz. *Macrosiphoniella yamagopholiae* (Shinji) ; *Sinomegoura citricola* V. d. Goot and *Brevicoryne brassicae* (L) are concerned, no information on the chromosomes of these species was available earlier. Thus the present studies add these species in the list of chromosomally known aphid species. Although two congeneric species studied here i. e. *Macrosiphum yamagopho iae* (Shinji) and *M. rosae* (L) show similar chromosome number, a considerable difference in the morphometry of their chromosomes was observed.

In all the seven species studied here, observations on the cell division showed no definite 'J' or 'V' shaped configuration and the chromosomal movement was observed as broad sheets side towards the poles, which indicated their possible holocentric nature and thus typically of the Homopteran type.

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