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CHROMOSOMES OF SIX SPECIES OF APHIDS (HOMOPTERA : APHIDIDAE)

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ABSTRACT

Somatic chromosomes from the embryos of apterous viviparous females of six species of aphids were studied viz., *Aphis spiraceola* Patch. (2n=8) ; *Tetraneura hirsuta* Baker (2n=14) ; *Brachycaudus helichrysi* (Kalt.) (2n=12) ; *Uroleucon sonchi* (L) (2n=12) ; *Lachnus similis* v. d. Goot (2n=12) and *Sitobion rosaeformis* Das (2n=18). Morphometric analysis of their individual chromosome pairs was carried out and karyotypes for these species were constructed. In *Brachycaudus helichrysi* (Kalt.), *Uroleucon sonchi* (L) and *Lachnus similis* v. d. Goot one pair of chromosomes was found to have an nuequal arm.

INTRODUCTION

So far thirty four species of Indian aphids are known chromosomally, but the details of chromosome morphology and kryotypes are available only in eight species (Kulkarni & Kacker, 1979 and in press and Kurl and Misra, 1980). In the rest of the cases only the diploid number or the probable sex-determining mechanism is discussed (Kurl & Misra, 1979 ; Khuda-Buksh, 1979 and Behura & Bohidar, 1979). The present paper deals with the chromosomes of six species of aphids viz., *Aphis spiraecola* Patch., *Tetraneura hirsuta* Baker, *Brachycaudus helichrysi* (Kalt.), *Uroleucon sonchi* (L), *Lachnus similis* v. d. Goot and *Sitobion rosaeformis* Das.

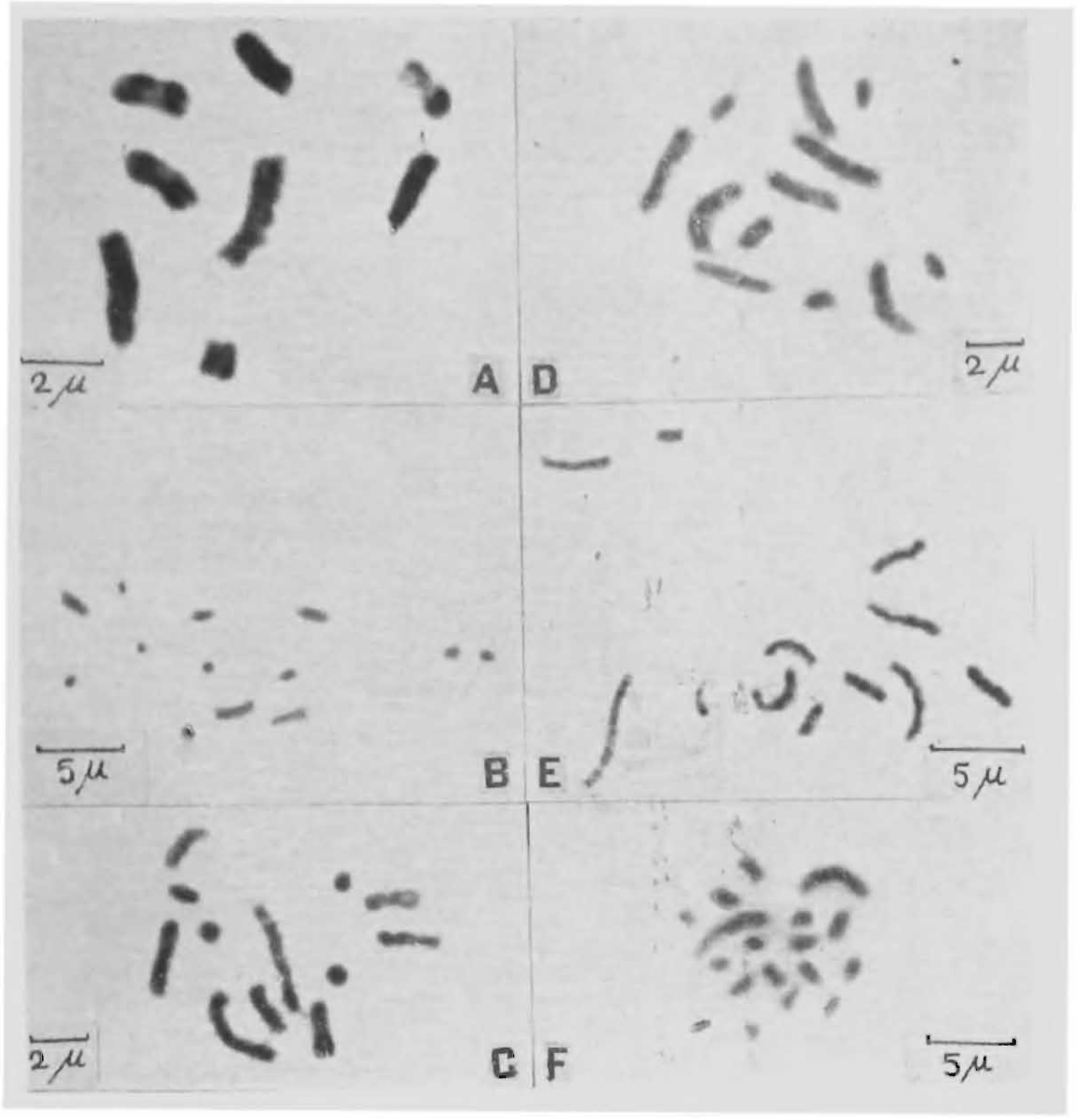
Material and Methods : Apterous viviparous females of aphids were collected and their embryos were used for the study of somatic chromosomes. Collection data for these species are given in table I. The technique employed in the cytological preparations was similar to that described earlier (Kulkarni & Kacker, 1979 and in press).

OBSERVATIONS

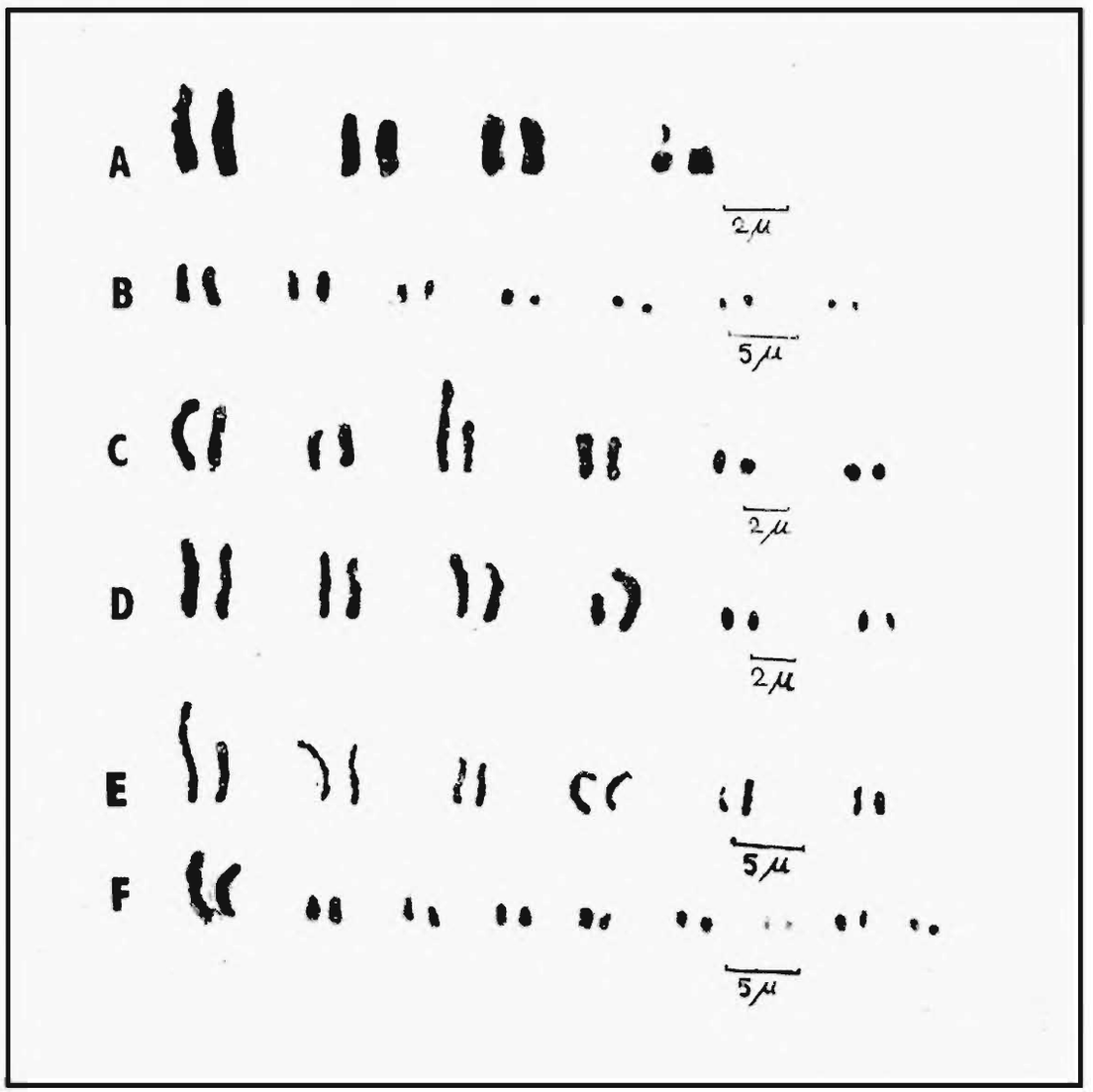
1. *Aphis spiraecola* Patch. The diploid chromosome number in this species was observed to be 8 (Plate VII A). The morphometric analysis of the chromosomal pairs reveled that the first pair was 30.28% of the total compliment and the last pair was only 14.45%. The second and the third pairs measured 27.00% and 24.75% respectively (Table II). Karyotype for this species is figured (Plate VIII A).

2. *Tetraneura hirsuta* Baker. Diploid chromosome number in this species was found to be 14 (Plate VII, B). The relative percentage lengths of first and second pairs were found to be 27.31 and 21.52 respectively. Third and fourth pairs were 13.90 and 12.00 percent of the total compliment. The last three pairs did not differ much in their

KULKARNI & KACKER PLATE VII



A. *Aphis spiraecola* Patch (2n = 8)
B. *Tetraneura hirsuta* Baker (2n = 14)
C. *Brachycaudus helichrysi* (Kalt.) (2n = 12)
D. *Uroleucon sonchi* (L.) (2n = 12)
E. *Lachnus similis* v. d. Goot (2n = 12)
F. *Sitobion rosaeformis* Das (2n = 18)



Karyotypes ;

A. *Aphis spiraecola* Patch
B. *Tetraneura hirsuta* Baker
C. *Brachycaudus helichrysi* (Kalt.)
D. *Uroleucon sonchi* (L.)
E. *Lachnus similis* v. d. Goot.
F. *Sitobium rosaeformis* Das

TABLE—I

Sr. No.	Name of the species	Host	Date of collection	Locality
1.	*Aphis spiraecola* Patch.	*Spinaecea oberacea* L.	9.3.79	Kunihar, Solan (H. P.)
2.	*Tetraneura hirsuta* Baker	*Synodon dactylon*	20.10.79	Mahananda wild life sanctuary, Sukna (W. B.)
3.	*Brachycaudus helichrysi* (Kalt.)	*Croton* sp. (from leaf galls)	17.3.79	Renuka Lake, Dadhau (H. P.)
4.	*Uroleucon sonchi* (L.)	*Sonchus arvensis* L.	17.3.79	Renuka Lake, Dadhau (H. P.)
5.	*Lachnus similis* v. d. Goot.	*Delbergia sisso*	15.3.79	Renuka Lake, Dadhau (H. P.)
6.	*Sitobion rosaeformis* Das	*Rosa* sp.	3.11.79	Tindharia, Kursiong, (W.B.)

percentage lengths and were found to be 9.76, 8.19, and 7.42 respectively (Table II). Karyotype for this species is constructed (Plate VIII, B).

3. *Brachycaudus helichrysi* (Kalt.) 2n number in this species was found to be 12 (Plate VII, C). The percentage lengths of the individual chromosome pairs are given in Table II. In some pairs of chromosomes the chromatids were observed to be separated to a considerable extent. The relative percentage lengths of the chromosomal pairs reveled uniform difference of size between lst and 2nd and 4th and 5th pairs. However, the third pair was unequal with one of the elements much longer (Plate VIII, C).

4. *Uroleuon sonchi* (L) : The diploid chromosome number in this species was observed to be 12, (Plate VII, D) the relative percentage lengths of the chromosome pairs showed the first pair 28.00%. Pairs 2,3 and 4 were observed to be in uniform decreasing order, while the last two pairs had comparatively low difference (Table II). The fourth pair in the compliment was observed to be unequal (Plate VIII, D).

5. *Lachnus similis* v. d. Goot : 2n number in this species was observed to be 12. The longest pair measured 22.61% and the shortest pair measured 9.20% of the total compliment. Rest of the pairs showed almost uniformally decreasing lengths when compared with each other (Table II). The karyotype for this species is given in Plate VIII, E.

6. *Sitobion rosaeformis* Das. : Diploid chromosome number in this species was observed to be 18 (Plate VII, F). This confirms the earlier observation of Kurl & Misra, 1979. However, the karyotype for this species was not available earlier, which is given in Plate VIII, F. The relative percentage lengths of its chromosomal pairs showed gradual reduction in their size but the first pair was observed to be considerably longer (Table II).

Discussion

Kulkarni & Kacker 1979 and in press have reported chromosomes of three species of *Aphis*. The present species, *Aphis spiraecola* Patch also shows more or less similar type of arrangement and relative percentage lengths of its chromosome pairs. Out of the six species studied here, the chromosomes of three species viz., *Uroleucon sonchi* (L), *Brachycaudus helichrysi* (Kalt.) and *Lachnus similis* v. d. Goot have shown one unequal pair in their compliments. The percentage length of this pair was found maximum in

TABLE—II

Relative Percentage Lengths of Chromosome Pairs

Sr. No.	Name of the species	Chromosome pair Nos.								
		1	2	3	4	5	6	7	8	9
1.	*Aphis spiraecola* Patch.	30.28	27.07	24.75	14.45					
2.	*Tetraneura hirsuta* Baker.	27.31	21.52	13.90	12.00	9.76	8.19	7.42		
3.	*Brachycaudus helichrysi* (Kalt,)	24.33	20.61	17.53	16.56	12.40	8.26			
4.	*Uroleucon sonchi* (L.)	28.00	21.20	19.10	15.51	8.96	7.24			
5.	*Lachnus similis* v. d. Goot.	22.61	22.21	18.16	15.03	13.11	9.20			
6.	*Sitobion rosaeformis* Das.	23.84	14.97	11.50	10.88	9.03	8.90	8.14	6.83	6.25

Lachnus similis v. d. Goot and it was the longest within its compliment.

In spite of the existence of unequal pairs, no differential staining pattern could be observed with the technique followed in the present studies. Further, definite sex-determining mechanism is not known in these species. This situation prevents us from arriving at any conclusion as to whether these are the sex chromosomes or the differential lengths are due to fusion or inversion. However, when the total lengths of the unhomologous pairs (averages of the both the components) are considered, these fill in the gaps in the gradual reduction of the chromosome pairs within the compliments. This fact supports the later view of involment of fusion or inversion mechanism.

In addition to the above observations, partial separation of the chromatids within the chromosomes were noticed (Plate VII A, B and C) which may apparently look unexpected considering the holocentric nature of the chromosomes within the group.

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REFERENCES

BEHURA, B, K. and BOIHDAR, K. 1979. On the diploid chromosomes of the genus *Rhopalosiphum* (Aphidoidea). *Symposium on recent trends in Aphidological Studies* : 47 (Abs.).

KHUDA-BUKSH, A. R. 1979. Chromosomes of three species of *Aphids* (Homoptera : Aphididae) : *Ibid* : 46 (Abs.)

KULKARNI, P. P. and KACKER, R. K. 1979. Chromosomes of four species of aphids (Homoptera : Aphididae). *Bull. zool. Surv. India*, **2** (1) : 1-2, 1 Pl.

KULKARNI, P. P. and KACKER R. K. 1979. Chromosomes of five species of aphids (Homoptera : Aphididae). (In Press)

KULKARNI, P. P. and KACKER R. K. 1979 A simple technique for preparation of somatic chromosomes of aphids (Homoptera : Aphididae). (In Press)

KURL, S. P. and MISRA, S. D. 1979. Karyological studies in two species of aphids (Homoptera : Aphididae) *Symposium on recent trends in Aphidological Studies* : 46 (Abs.).

KURL, S. P. and MISRA S. D. 1980. Chromosomal study of *Brachyunguis calotropicus* (Homoptera : Aphididae). AKITU *N. Ser.*, **29** : 1-2.