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CYTOLOGY OF *PIPER* SPECIES FROM THE WESTERN GHATS

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ABSTRACT

Chromosome numbers were determined for eight species of *Piper* namely *P. argyrophyllum* Miq., *P. attenuatum* Ham., *P. galeatum* C. DC., *P. longum* Linn., *P. nigrum* Linn., *P. trichostachyon* C. DC., *P. hookeri* Miq., and *P. mullesua* Ham. The first six species showed a chromosome number of 2n = 52 and the last two, 2n = 104 each. A glance at the chromosome numbers of *Piper* spp. so far recorded from India, shows that mostly multiples of 12 chromosomes have been reported from the North India and multiples of 13 from the South India. It may be assumed that the species from these two centres of distribution probably had different evolutionary pathway starting from basic numbers of 6 and 7.

INTRODUCTION

The importance of cytological study in tracing the systematic position, the interrelationship of different species and in understanding their evolutionary trends, have been amply demonstrated in many plant species. In the genus *Piper* which has been considered as a difficult one from taxonomic point (Hooker, 1886), cytological investigation gains added importance.

MATERIALS AND METHODS

Determination of chromosome numbers was made from squash preparation of root tip cells. Eight species *viz.*, *P. argyrophyllum* Miq., *P. attenuatum* Ham., *P. galeatum* C. DC., *P. hookeri* Miq. (= *P. hymenophyllum* Miq.), *P. longum* Linn., *P. mullesua* Ham. (= *P. brachystachyum* Wall.), *P. nigrum* Linn, and *P. trichostachyon* C. DC., were studied. Actively growing root tips were collected between 10.00 and 14.00 hrs. and pretreated in 0.002 mo. aqueous solution of 8–hydroxyquinoline for about two hours at low temperature. After a thorough wash in running water, they were fixed in Carnoy's fluid (6:3:1) for 12 to 24 hrs. Hydrolysis and staining were done simultaneously by transferring them from the fixative to a watch glass containing 2% propiono orcein and 1N HCI (9:1). The watch glass was warmed over a spirit flame and the roots were allowed to cool down in this solution for about 30 min. The meristematic portion of the roots were separated on to a slide and squashed in a drop of

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propiono orcein by applying uniform sure over the cover glass.

RESULTS

Two different somatic chromosome numbers *viz.*, 2n = 52 and 2n = 104 were observed in the eight species studied. Chromosomes were very small in size and varied from 2.5 μ to 0.7μ. Table I shows chromosome numbers determined in the present study. Photomicrographs of the mitotic chromosome complements

Table I. *Chromosome number in* Piper *species*

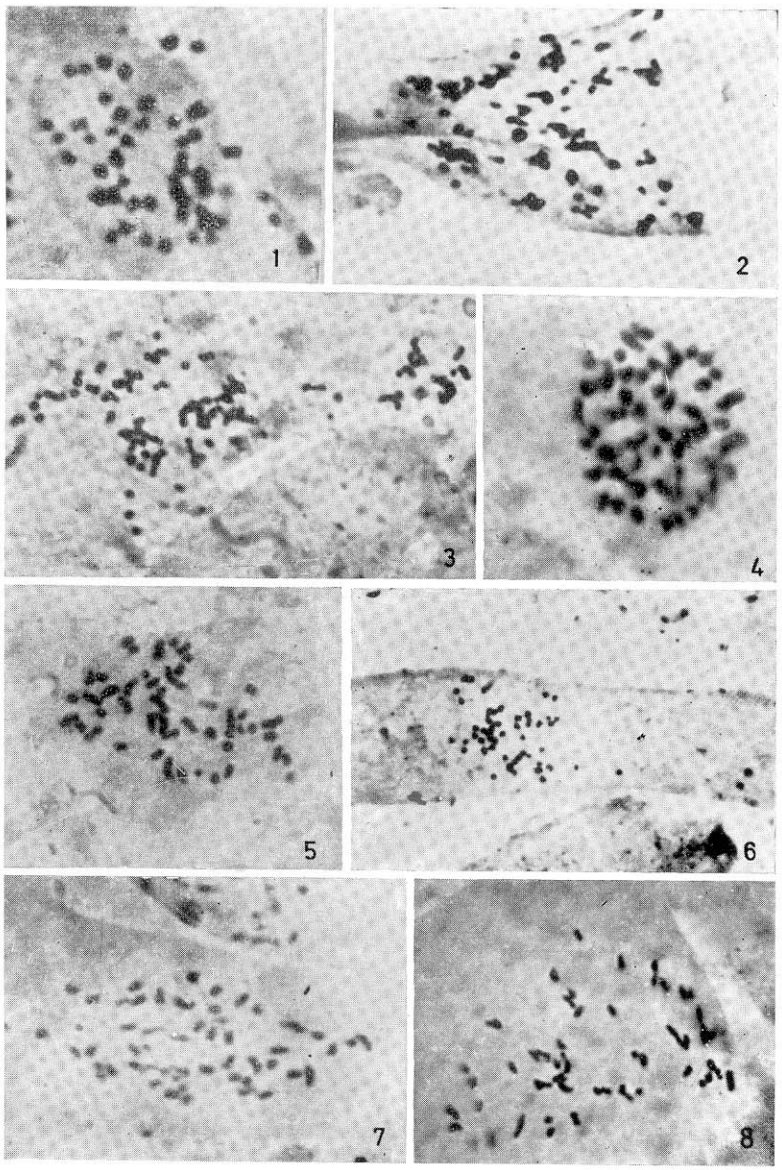
Species	Chromosome number		
	Earlier report	Authority	Present report
	2 n		2 n
P. argyrophyllum Miq.	26, 39	Samuel & Bavappa, 1981	52
P. attenuatum Ham.	26, 39	Samuel & Bavappa, 1981	52
P. longum Linn.	24	Tjio 1948	52
	26	Samuel & Bavappa 1981	
	48	Dasgupta & Dutta, 1976	
	48, 96	Sharma & Bhattacharya, 1959	
	52	Mathew, 1958	
P. nigrum Linn.	36, 60	Dasgupta & Dutta, 1976	52
	48	Sharma & Bhattacharya, 1959	
	52	Martin & Gregory, 1962	
	52, 65	Samuel & Bavappa, 1981	
	52, 104	Mathew, 1958; 1972	
	Circa–128	Janaki Ammal, 1945	
P. betle Linn.	32	Johnson, 1910	
	32	Janaki Ammal, 1945	
	78	Mathew, 1958	
	64	Sharma & Bhattacharya, 1959	
	64	Dasgupta & Dutta, 1976	
	26, 52	Samuel & Bavappa, 1981	
P. galeatum, C. DC.	—	——	52
P. hookeri Miq.	—	——	104
P. mullesua Ham.	—	——	104
P. trichostachyon C. DC.	—	——	52
P. chaba Hunt.	24	Janaki Ammal, 1945	
P. chuvya Roxb.	52	Samuel & Bavappa, 1981	
P. cubeba Linn.	24	Janaki Ammal, 1945	
,,	24	Dasgupta & Datta, 1976	
P. futokadzura sub. & Zuce.	24	Yoshida, 1960	
P. geneculatum Sw.	28	Maugini, 1951	
P. grissico - argenta Yunck.	22	Smith, 1966	
P. magnificum Trel.	26	Smith, 1966	
,,	24	Dasgupta & Datta, 1976	
P. medium Jacq.	28	Mugini, 1951	
P. ornatum N.E.Br.	80	Sharma & Battacharya, 1959	
P. sylvestre Lamk.	26, 39	Samuel & Bavappa, 1981	
P. thwaitseii C. DC.	39, 65	Samuel & Bavappa, 1981	
P. trineuron Miq.	26	Samuel & Bavappa, 1981,	
P. unguiculatum Ruiz & Pav.	28	Maugini, 1951	
P. zeylanicum Miq.	39	Mathew, 1958	

of the eight species are presented in Fig. 1.

DISCUSSION

Though the genus *Piper* consists of more than 3000 species (Rahiman and Nair, 1983), only 24 species, including 8 species studied in the present investigation, have been cytologically studied so far. In the genus, chromosome number of 2n = 22, 24, 26, 28, 32, 36, 39, 48, 52, 60, 64, 65, 78, 80, 96, 104

Fig. 1. Somatic chromosomes of *Piper*



1. *P. argyrophyllum* Miq., 2. *P. mullesua* Ham., 3. *P. hookeri* Miq., 4. *P. trichostachyon* C. DC., 5. *P. longum* Linn., 6. *P. attenuatum* Ham., 7. *P. nigrum* Linn., 8. *P. galeatum* C. DC.

and *circa* 128 have been reported (Table I). The numbers do not follow a clear arithmetic progression and as such seemingly difficult to draw any definite conclusions regarding the basic chromosome number. Since the chromosome number is large and the size is small, it is difficult to count accurately the chromosome numbers in *Piper* species unless the technique is perfect. Mathew (1958) has raised some doubt about the accuracy of some of the earlier reports.

Hooker (1886) recognised three different distributional centres in the Indian subcontinent. They are (1) Transgangetic provinces (covering a major portion of Indus and Gangetic plains in North India), (2) Southern Deccan (South India) and Ceylon (Sri Lanka). From the Table I it is clear that mostly multiples of 12 have been reported from North India (2n = 24, 36, 48, 60, 96) and multiples of 13 (2n = 39, 52, 65, 104) have been reported from South India and Sri Lanka. In the light of the above observation it may be assumed that the species from these two centres distribution probably had different evolutionary pathway starting from basic number of 6 and 7. It is possible that number n= 13 reported consistently had to be taken as the valid basic number for the South Indian and the Sri Lankan *Piper* and probably might have arisen from hybridisation of types with n=6 and 7 as postulated by Mathew (1958). Samuel and Bavappa (1981) have reported 2n = 26 for four different species and these species can be considered as diploid and species with 2n = 52, in that case, are to be considered as tetraploids. From the little information available at present on cytology of the genus, it seems that the evolution of the genus is complicated by different primary basic numbers, amphidiploidy and vegetative propagation.

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