lar cell DNA synthesis, and inhibiting tubular ATP-ase and other transport enzymes[11]. In addition to its utility in the study of the pathogenesis of renal cystic disease, the organ culture model may have particular usefulness in the study of mechanisms by which tubular changes are induced by CP. The model isolates tubular toxicity from the influences of vascularization and permits a degree of experimental control which cannot be attained with in vivo models. Further, the use of completely defined serum-free medium in the organ culture model permits precise analysis of the biochemical changes which may mediate CP nephrotoxicity. Current studies are under way to define the biochemical changes which may precede or mediate CP-induced cystic changes in this model.

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Colchicine induced interchanges in chillies (*Capsicum annuum* L.)

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Summary. Seeds of *Capsicum annuum* L. cultivar cerasiformies were treated with 0.4 and 0.2% aqueous colchicine solution for 24 and 72 h respectively. Tetraploids were not realized; instead, interchange heterozygosity was observed in several plants in 0.4% treatment. The interchanges varied from 1 to 3 per plant. It is presumed that colchicine has induced chromosome breaks.

Colchicine as a polyploidizing agent in various taxa has been well established. The fact that it also possesses mutagenic properties was first observed in *Sorghum*[2-7]. It was also noticed that this chemical has mutachromosomic properties[8], as first reported in chillies[9], in which a single interchange resulted with less than 50% pollen sterility but with good seed setting. Subsequently similar effects were reported in *Collinsia*[10], rye grass[11], and castorbeans[12]. The present study is a report of multiple chromosome interchanges induced by colchicine in *Capsicum annuum* L. cultivar cerasiformies.

Seeds of *C. annuum* were obtained from Government Agricultural Research Station Lam-farm, Guntur, Andhra Pradesh, India. To obtain polyploidy, 2 seed samples of 40 each were treated wtih 0.4 and 0.2% of aqueous colchicine (E. Merck, FRG) for 24 and 72 h respectively. Out of the 80 seeds thus treated, only 25 seeds germinated and grew to normal size (13 in 0.4% and 12 in 0.2%). Cytological screening of these plants revealed that polyploidy was not induced in any one of the surviving plants. Instead, interchange heterozygosity was noticed in 9 plants out of the 13 that were treated with 0.4% colchicine. Out of the 9 plants with interchanges, 3 interchanges each were recoreded in 2 plants, 2 interchanges in 2, while a single interchange was present in the remaining 5 plants.

Frequency of colchicine induced chromosomal interchanges at metaphase I in *Capsicum annuum* L.

Plants	Total No. of PMCs	Percentage of PMCs with interchanges						
		3 interchanges	2 interchanges	1 interchange	12 IIs	11 IIs+2 Is	10 IIs+4 Is	Pollen sterility (%)
1	120	50.00	20.00	10.00	5.00	3.33	11.66	83.20
2	110	59.09	16.36	14.54	1.81	-	8.18	88.50
3	90		60.00	13.33	15.55	-	11.11	82.00
4	90		66.67	12.22	4.44	11.11	5.55	83.80
5	100			75.00	6.00	8.00	11.00	80.10
6	90			64.44	20.00	7.78	7.78	76.90
7	100			73.00	15.00	4.00	8.00	78.00
8	110			63.64	18.18	10.00	8.18	76.80
9	71			100.00	-	-	-	84.70

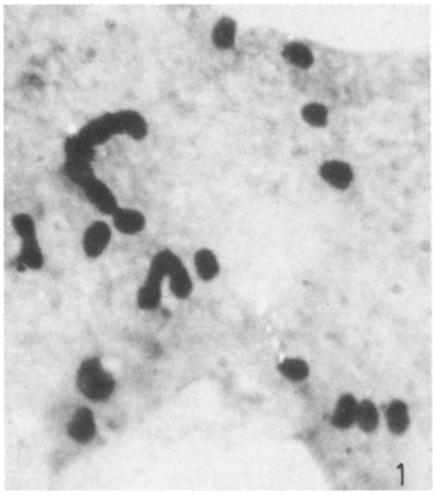

Figure 1. Metaphase I with 1 chain of six, 1 chain of three, 2 bivalents and 11 univalents.

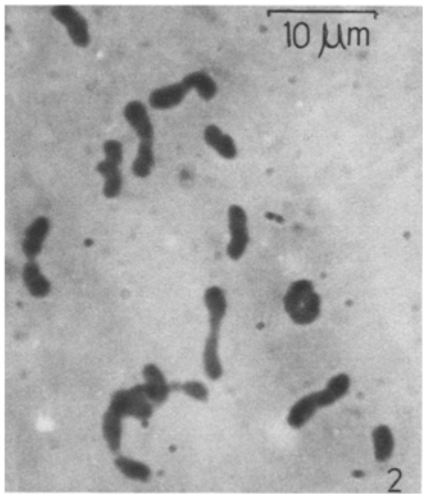

Figure 2. Metaphase I with 1 chain of four, 8 bivalents and 4 univalents.

In view of this complexity, there was higher pollen abortion coupled with a very poor seed set. The remaining 4 plants under this treatment exhibited regular meiosis and good pollen fertility. In 2 plants, an association of 6 chromosomes (either a ring or a chain) and an association of 4 (a ring or a chain) were located in the PMCs at diakinesis and metaphase I, indicating that there were 3 interchanges involved in the complex. In a great majority of the PMCs of these 2 plants, chromosome associations revealing 1, 2, or 3 interchanges were encountered both at diakinesis and metaphase I. In a few PMCs however, either 12 bivalents, or 11 bivalents and 2 univalents, or 10 bivalents and 4 univalents, were realized (table). Chain types of interchange associations were, in general, predominant (92.5%). Rings were also recorded although at a low frequency (7.5). In 1 plant an association of 7 chromosomes (a chain) was recorded at both diakinesis and metaphase I. When short segments of the different nonhomologous chromosomes are involved, chain types of interchanges should be formed, wheras interchange of large chromosome segments should lead to ring formation. The high percentage of chain type associations observed may be explained either by exchange of short chromosome segments or when large segments of the chromosomes were involved by chiasmatic failure at one of the arms in a majority of the nuclei resulting in the formation of chains at a greater frequency.

A study of the co-orientation pattern of the interchange multiples at metaphase I revealed that the interchanged chromosomes occurred in an adjacent orientation in a greater proportion of the PMCs (56.3%), while linear (32.4%) and alternate (11.3%) types occurred in lesser proportions in 1 plant. This trend was observed in all the plants, as revealed by the observation of 679 PMCs. In view of the occurrence of higher proportion of adjacent and linearly oriented chromosomes than the alternate type, the high pollen sterility observed in these plants is expected. The interchanges ranged from 1 to 3 and the pollen sterility also varied from 77 to 89%. From the sample treated with 0.2% colchicine, 12 plants alone survived. At maturity all plants showed regular meiosis and were normal diploids without any apparent interchange heterozygosity.

25 plants were raised from untreated seeds of the same accession. Cytologically all the plants showed normal meiotic behavior with 12 bivalents and good pollen fertility (89.5%).

Since interchanges were not observed in the untreated sib plants, the presence of interchanges in the treated plants is considered to result from colchicine-induced chromosome breaks. In some of the earlier reports chromosome breakage was also observed to be induced by high concentrations of colchicine (0.35 to 0.5%) and prolonged treatments (12–16 h[2-7,12]). In the absence of a selective action of colchicine on DNA synthesis[13], it seems to work through secondary and tertiary structures[14], of residual protein portions of the chromosomes under suitable internal conditions determined by the genotype as indicated in Sorghum[5]. It is yet to be confirmed whether in this taxon colchicine breaks particular or different sites along the chromosomes involved. These interchange complexes were not studied at the pachytene stage to determine the point of breakage in each nonhomologous chromosome relative to the centromere position.

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