$x = 13$ has arisen from $x = 12$; Eurasian species of *Allium*[6] ($x = 8$), which originated from the primitive North American species ($x = 7$); and *Zea mays*[7], where $x = 10$ was concluded to be a derivative of $x = 5$. A decrease in basic chromosome number has also been observed in many plants[8].

Formation of two trivalents per cell in 23% of cells of *P. mezianum* and 30% of cells of *P. schweinfurthii* suggests duplication of two chromosomes in these species. Formation of one quadrivalent in *P. schweinfurthii* was also reported earlier[9]. The occurrence of higher associations in these species could be attributed to homology to the basic complement following duplication and differentiation during the evolution of these species.

Based on the observed higher associations in the diploid complement of *P. schweinfurthii* and *P. mezianum*, it may be assumed that the chromosome complement in *Pennisetum* has evolved from a basic chromosome number like $x = 5$. The occurrence of a species with $x = 5$ in *Pennisetum*, such as *P. ramosum*, further supports this view. This is in agreement with the conclusions of Jauhar[2] and suggests that *P. glaucum* is a secondary balanced species with phyletic basic chromosome number $x = 5$.

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1. Jauhar, P. P., *Genetica*, 1968, **39**, 360.
2. Jauhar, P. P., *Genetica*, 1970, **41**, 532.
3. Manga, V. and Pantulu, J. V., *Genetica*, 1971, **42**, 319.
4. Darlington, C. D., *Chromosome Botany*, Allen and Unwin, London, 1956.
5. Darlington, C. D., *Proc. R. Soc.*, 1936, **B121**, 264.
6. Leven, A., *Hereditas*, 1935, **20**, 289.
7. Molina, M. del C. and Naranjo, C. A., *Theor. Appl. Genet.*, 1987, **73**, 542.
8. Stebbins, G. L. Jr., *Variation and Evolution in Plants*, Oxford Book Co., Calcutta, 1964.
9. Hanna, W. W. and Dujardin, M., *Crop. Sci.*, 1986, **26**, 449.

INDUCED COMPLEX TRANSLOCATION HETEROZYGOSITY IN CHILLI

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In work on induced mutagenesis in chillies, a complete sterile plant was isolated from the M_1 population of a fast-neutron treatment (2.6×10^{10} n/cm^2/4.5 min). As there was poor flowering and no fruit setting in the plant, its meiosis was studied.

Genetically pure and 'dry' seeds (moisture content 6.08%) of *Capsicum annuum* L. cv. NP 46A were subjected to fast neutron treatment at the Bhabha Atomic Research Centre, Trombay. The M_1 population was raised from the irradiated seeds along with control plants. Flower buds of suitable size were fixed in acetic : alcohol (1 : 3) and squashed in 1% acetocarmine solution.

The sterile plant differed from the control in several morphological characters (table 1). It was characterized by delayed flowering. No fruit set was obtained because of cent per cent flower abscission.

Meiotic characters of the control and sterile plants are given in table 2. Control plants showed 12 bivalents uniformly at diakinesis (figure 1). In the aberrant type, a hexavalent ring or chain was commonly found in many of 200 pollen mother cells (PMC) studied; the ring configuration was most common (figure 2). Only terminal chiasmata were observed in both the control and the aberrant type. The meiotic abnormalities included unoriented chromosomes (14.98% at MI, 2.34% at MII), laggards (11.26% at AI, 2.81% at AII), unequal distributions (4.69% at AI, 1.87% at AII) and chromosome bridges (10.32% at AI). Total meiotic abnormalities (46.47%) and pollen viability (23.15%) in the sterile

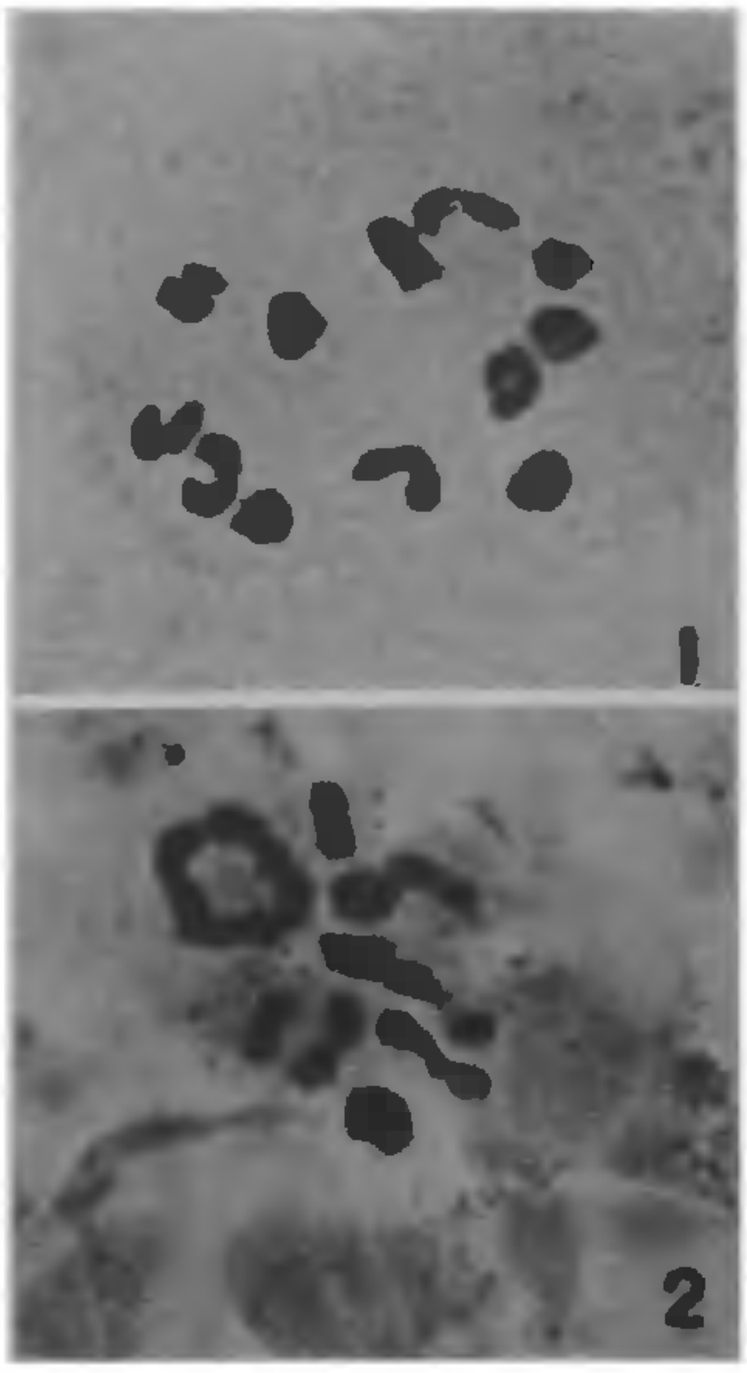
Table 1 *Comparative morphology of control and sterile Capsicum annuum*

Plant character	Control	Sterile
Plant height (cm)	38.0	27.0
Plant spread (cm)	52.0	20.0
No. of main branches	1	2
Leaf size (l × b of lamina, cm)	4.7 × 3.2	2.2 × 1.8
Petiole length (cm)	2.4	1.1
Days to flowering	80	110
Total no. of flowers formed	200	25
Flower abscission (%)	22	100
Total no. of fruits formed	178	—

Table 2 *Meiotic characters of control and sterile Capsicum annuum*

Meiotic character	Control	Sterile
Univalents	0	0–5
	(0)	(0.23)
Ring bivalents	1–6	0–5
	(2.88)	(0.29)
Rod bivalents	6–11	2–11
	(9.12)	(8.25)
Ring hexavalent	0	0–1
	(0)	(0.7)
Chain hexavalent	0	0–1
	(0)	(0.16)
Average chiasma frequency/cell	14.88	13.92
Average chiasma frequency/ chromosome	0.62	0.58
Meiotic abnormality (%)	8.33	46.47*
Pollen viability (%)	88.54	23.15*

Figures in parentheses are average.
*Significant at 1% level.



Figures 1 and 2. **1,** Diakinesis in control plant showing 12 bivalents. **2,** Diakinesis in sterile plant showing one hexavalent and nine bivalents.

plant were significantly different (at 1% level) from those in the control.

Translocation heterozygotes involving quadrivalents were reported earlier in chilli from fast neutron and gamma ray-treated populations[1,2]. Since hexavalent configuration commonly appeared in PMC of the sterile plant, it indicates a case of complex translocation heterozygosity. In complex heterozygotes, two reciprocal translocations are probably involved in causing six chromosomes to unite in a pairing configuration. The complex heterozygosity is well known in the genus *Oenothera*, where not only forms with ring of 6 chromosomes are present but also those with ring or chains of 8, 10, 12 and even all 14 chromosomes[3]. Multiples with chromosome association greater than four are reported to occur naturally in some plants like *Clarkia*, *Paeonia*, etc[4].

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1. Bansal, H. C. and Singh, Dalmir, *Curr. Sci.*, 1972, **41**, 853.
2. Laxmi, N. and Rao, N. B., *Indian J. Bot.*, 1978, **1**, 143.
3. Cleland, R. E., *Adv. Genet.*, 1962, **11**, 147.
4. Schulz-Schaeffer, J., *Cytogenetics—Plants, Animals, Humans*, Springer-Verlag, New York, 1980.

TISSUE CULTURE STUDIES ON DESERT PLANTS: I. *CENCHRUS CILIARIS* CV. 75

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PLANT cell and tissue culture offer great potential in evolving elite plants for sub-optimal environments. Our research programme, using this method, is concerned with improvement of fodder grasses of the Thar desert with respect to their tolerance to drought, salt, heavy metals and other environmental constraints. In this communication we report conditions that favour *in vitro* differentiation of plantlets from young inflorescences of *Cenchrus ciliaris* (Anjan Dhaman) cv. 75.

Young inflorescences, before their emergence from the sheathing leaves, were removed from the plants and surface-sterilized by thoroughly wiping with 70% ethanol and then treating them with mercuric