Genetic Breakdown of Chromosome Behaviour of *Tribulus terrestris*

A fertile polyploid series has been known to exist within *Tribulus terrestris* (Zygophyllaceae) with plants having $n = 12$ (diploid), 18 (triploid)and 24 (tetraploid) chromosomes[1,2]. Recently TANDON and RAO[3] have discussed the mechanism of evolution of higher chromosomal forms in *Tribulus terrestris* and indicated its significance for control measures of certain weeds. The present study deals with the genetic control of chromosome behaviour of *Tribulus terrestris*.

In a naturally occurring triploid population of *T. terrestris*, a plant with morphological variation was spotted. This plant was vigorous in growth, densely hairy and bore larger flowers and more pairs of leaflets per rachis than the normal triploids. A cytological study of microsporogenesis was, therefore, considered desirable. Flower buds were fixed in Carnoy's fluid (6 parts absolute alcohol + 3 parts chloroform + 1 part glacial acetic acid) for less than 1 h. They were then transferred for 24 h to propionic alcohol (1:3) where propionic acid had been saturated with ferric acetate. Squash preparations of anthers were prepared in propionocarmine[4].

In naturally occurring triploids, meiosis was normal with 18 bivalents at diakinesis and at metaphase I (Figure 1). At metaphase I the chiasma frequency per cell and per bivalent was 20.15 and 1.11 respectively. The disjunction of chromosomes at anaphase I was normal with 18:18 distribution of chromosomes to the poles. Metaphase II and anaphase II were regular. Normal tetrads were formed after completion of the second division. The pollen fertility was 78.3. A meiotic study in pollen mother cells of the morphological variant showed that it was at triploid level. At diakinesis and metaphase I, a large number of univalents was observed (Figure 2). The mean number of bivalents, univalents and multivalents per cell at metaphase I was 10.53, 14.54 and 0.09, respectively. The chiasma frequency per cell and per bivalent was 12.81 and 0.71, respectively; 20% of the cells showed laggards at telophase I. At anaphase II, 6% of the cells showed micronuclei. The plant was sterile. The pollen fertility was as low as 0.19%.

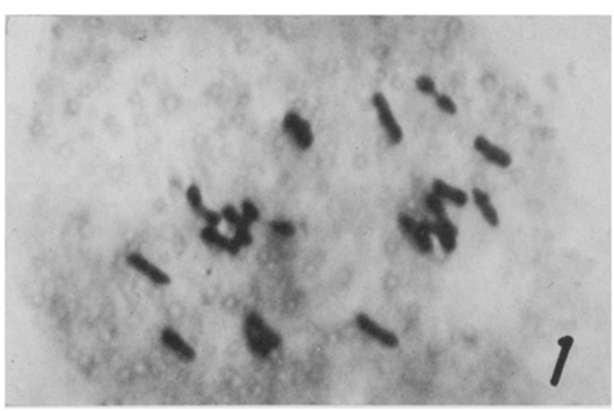

Fig. 1. Metaphase I in naturally occurring triploid showing 18 bivalents.

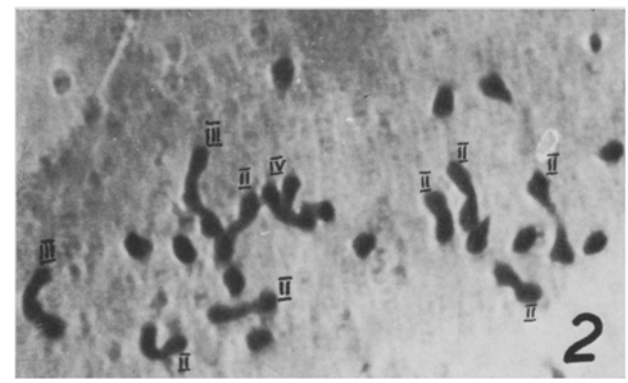

Fig. 2. Metaphase I in sterile triploid showing 7 bivalents (marked as II), 1 quadrivalent (marked as IV), 2 trivalents (marked as III); the remaining 12 chromosomes, which are unmarked, are all univalents.

At present sufficient evidence is available on genetic control of chromosome pairing in polyploids[5–7]. Experiments have indicated that this genetic control is confined to a single locus[7]. It is known that gene mutation of recessive nature is responsible for variation in pairing behaviour of chromosomes[8]. Disruption or weakening of the association of homologs has been ascribed to the homozygosity of recessive alleles[7]. The occurrence of a sterile triploid plant, showing failure of normal chromosome pairing, in a fertile population of triploids, is probably due to a spontaneous gene mutation. It is also likely that, as reported in other cases, the mutated gene, in the homozygous condition, led to a genetic breakdown of normal meiosis. The sterility caused by genetic breakdown of meiosis is not an adaptive evolutionary advantage in case of *Tribulus terrestris*.

Zusammenfassung. Das Vorkommen einer fruchtbaren Polyploidie-Serie innerhalb *Tribulus terrestris* war bekannt ($n = 12$, Diploid, $n = 18$, Triploid, und $n = 24$, Tetraploid). Untersuchung über die Zytologie eines unfruchtbaren, natürlich vorkommenden Triploides deutet auf genetische Kontrolle bei der Paarbildung der Chromosomen von *Tribulus terrestris*.

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[1] C. D. DARLINGTON and A. P. WYLIE, *Chromosome Atlas of Flowering Plants* (George Allen and Unwin Ltd., London 1955).
[2] B. V. SHETTY, J. scient. ind. Res. *20C*, 28 (1961).
[3] S. L. TANDON and G. R. RAO, Indian J. Hort, in press (1968).
[4] M. S. SWAMINATHAN, M. L. MAGOON and K. L. MEHRA, Indian J. Genet. *14*, 87 (1965).
[5] R. RILEY and V. CHAPMAN, Nature, Lond. *182*, 713 (1958).
[6] R. RILEY, V. CHAPMAN and G. KIMBER, Nature, Lond. *186*, 259 (1960).
[7] R. RILEY and C. N. LAW, Adv. Genet. *13*, 57 (1965).
[8] H. REES, Bot. Rev. *27*, 288 (1961).

Giant Sex Chromatin in Endopolyploid Trophoblast Nuclei of the Rat

Secondary giant cells in the trophoblast of white rat placenta originate by endomitotic processes[1–4]. Because this is an unique event in mammals, the degrees of endopolyploidy (DNA contents) of the giant nuclei were reexamined, and the nuclear structure was studied with special reference to the behavior of the inactivated *X* chromosome in female embryos.

White rats were killed when pregnancy had reached 14 days, and the uteri were fixed in ethanol-acetic acid (3:1). For a first orientation, sections were made and