

**Desynaptic effect of trisomy in *Pisum sativum*.**

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Considering the value of cytogenetics in relation to pulse improvement, an attempt is being made at IARI to develop trisomic lines in *Pisum sativum*. This may facilitate not only the location of genes on specific chromosomes but also help to transfer the genes selectively. To start with, seeds were obtained from the United Kingdom where work on *Pisum* trisomics was already in progress. In all, 25 seeds of a trisomic plant were obtained and planted in pots. At pod formation, some of the plants showed abnormal seed development. In each pod only one seed developed normally; the rest of the seeds failed to develop. Pollen fertility was found to be very poor. To determine the cause of this poor seed development and low pollen fertility, the first meiotic metaphase (MI) was examined in one plant. The young buds were fixed in acetic alcohol (1 : 3) for 24 h and slides were prepared for analysis. The chromosome count revealed the plant was a trisomic ( $2n = 15$ ). The MI stage was found to be quite abnormal. Instead of 6 bivalents and a trivalent, 1 to 11 univalents were present.

To study the situation in more detail, 50 cells were analysed at MI for number of bivalents (ring or rod), trivalents, univalents, and chiasmata per cell (Table 1). On average there were 1.02 ring bivalents, 2.76 rod bivalents, 0.30 trivalents and 6.54 univalents per cell. The mean chiasma frequency was found to be only 6.76 per cell, much lower than is generally observed in *Pisum* (16 to 18 chiasmata per cell). The reduction in chiasma frequency may be explained by the failure of chromosome pairing which resulted in the occurrence of univalents at MI.

The process of meiosis is believed to be under the control of several genes. These genes probably operate in a specific order which leads to the production of normal meiotic products. In this respect, asynaptic and desynaptic mutants are very important because they enable us to identify genes controlling meiosis. In *Pisum*, there are several reports on the effects of asynapsis (5, 8, 9) and desynapsis (2, 3, 4, 6, 7). Both processes reduced chiasma frequency and pollen fertility.

Table 1. Chromosome configurations in a trisomic plant of *Pisum sativum* (50 cells were analysed).

	Bivalents		Trivalents	Univalents	Chiasmata
	Ring	Rod			
Total	51	138	15	327	338
Mean per cell	1.02	2.76	0.30	6.54	6.76
Range	0-4	0-5	0-1	1-11	3-13

In the present case, the effects were typical of desynapsis like those reported in *Pisum* by Gottschalk and Klein (6). However, in the latter case the desynapsis occurred in mutants while in the present study the desynaptic effects were caused by the additional genes present on the trisomic chromosome (the identity of the extra chromosome is not yet known). This kind of

failure of chromosome pairing due to the presence of a trisomic chromosome has not been reported in *Pisum* but it has been reported in *Triticum aestivum*, where the additional dosage of the gene involved in chromosome pairing reduced the pairing between homologous chromosomes and caused the occurrence of univalents. It is hoped that the progeny of the trisomic plant used in our study may serve as a good source for isolating different trisomic lines in *P. sativum*.

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1. Feldman, M. 1966. Proc. Natl. Acad. Sci. USA 55:1447-1453.
  2. Gottschalk, W. and Jahn, A. 1964. Z. Vererbungslehre 95:150-166.
  3. Gottschalk, W and Baquar, S.R. 1971. Canad. J. Genet. Cytol. 13:138-143.
  4. Gottschalk, W. and Milutinovic, M. 1973. Nucleus 16:1-10.
  5. Gottschalk, W. and Konvicka, O. 1975. Cytobiologie 10:458-467.
  6. Gottschalk, W. and Klein, H.D. 1976. Theor. Appl. Genet. 48:23-34.
  7. Klein, H.D. 1969. Mutation Res. 8:277-284.
  8. Klein, H.D. 1970. Caryologia 23:251-257.
  9. Koller, P.C. 1938. J. Genet. 36:275-306.