Colchicine Induced Chromosomal Interchange in Castor Beans (*Ricinus communis* Linn.)

The polyploidizing effect of colchicine has long been known. It has also been discovered to be a mutagen in Sorghum[1-6] and a radiomimetic or mutachromosomic chemical[7], as first reported in Collinsia[8] and later in Phlox[9] and in rye grass[10]. In the present work, the chromosome-breaking property of colchicine in castor beans is investigated.

Twelve seedlings of castor type E.C. 32224 were raised in earthen pots to induce colchiploidy. Their apical meristem, as well as lateral vegetative buds, following the emergence of cotyledonary leaves, were treated with 0.35% aqueous solution of colchicine. All the treated seedlings survived and produced main stem as well as lateral branches from the colchicine-treated growing points. In the meiotic study of the pollen-mother cells of floral buds arising from the treated shoots, 6 plants turned out to be auto-tetraploids both in the main stem and in lateral branches; 5 were chimeral tetraploids and the remaining 1 had in 1 of the lateral branches an interchange complex involving 1 or 2 chain-type of association of 4 chromosomes plus 8 or 6 bivalents in its sporocytes at metaphase I (Figure 1), whereas its main stem and other lateral branches were tetraploids. Some of the sporocytes of the interchange-complex bearing lateral branches also had 10 free bivalents (Figure 2). The frequencies of pollen mother cells (PMC) with 1 or 2 chain-association of 4 chromosomes and 10 free bivalents are given in the Table.

As the pachytene chromosomes did not lend themselves to a study of their morphology, it was not possible to determine the point of breakage in each non-homologous chromosomes relative to the centromere positions. However, on the basis of chain-type of configuration and presence of 10 free bivalents at M_1, it can be surmised that 2 short segments might have been involved in the interchange[11]. About 30–35% pollen grains of the translocation heterozygote raceme were collapsed and empty. It had reduced seed-setting with 1, sometimes 2 cocci in a capsule containing aborted ovules. The affected branch continued to bear the characteristics in its subsequent branch.

It is yet to be confirmed whether colchicine in this species breaks particular or different sites along the chromosomes. In the absence of colchicine's selective action on DNA synthesis[12], it seems to work through secondary and tertiary structure[13] of residual protein portion of the chromosomes under suitable internal conditions determined by the genotype as indicated in Sorghum[4,14].

Frequencies of chromosomal associations at metaphase I for translocation-heterozygote in *Ricinus communis* Linn.

Total No. of analyzable cells	10 free bivalents	Chain type associations involving	
		1 quadrivalent	2 quadrivalents
373	32	222	119

Fig. 1. 1 chain quadrivalent at metaphase 1.

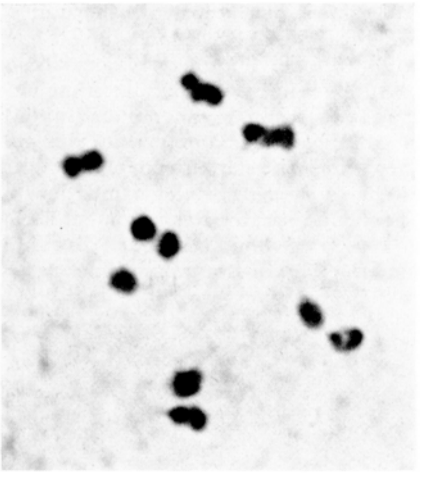

Fig. 2. 10 bivalents at metaphase 1.

Zusammenfassung. In mit Colchicin behandelten Pflanzen von *Ricinus communis* wurden neben tetraploiden Zellen auch solche mit Chromocomenbrüchen gefunden.

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