RECIPROCAL TRANSLOCATION IN PEA

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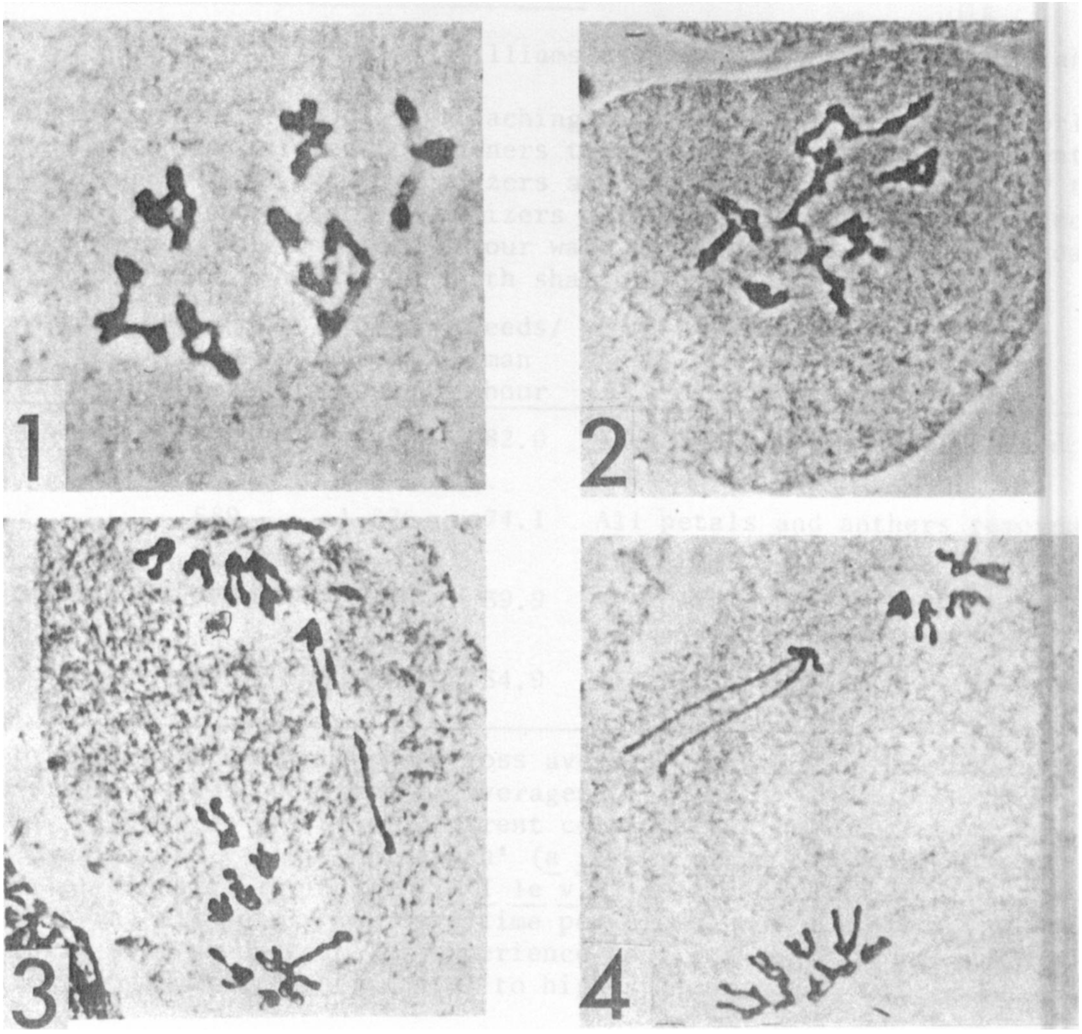
Interaction of recessive mutant genes has led to some new and bizarre genotypes in the garden pea. During one such synthesis of digenic and trigenic pea mutants, translocation heterozygosity was detected in the progeny of a plant homozygous for acacia, afila, and cochleata (tl^w, af, coch). Such translocations were not detected either in the single gene mutants or in the two gene recombinants viz. acacia/afila, acacia/cochleata, afila/ cochleata. Since such translocations appeared only when these three mutant genes were present together in a homozygous state, it was thought that the translocations are not only gene-dependent but also genome-dependent (1). But further studies have not revealed that the translocation is simply due to a gene mutation in the trigenic pea mutant and its genetic status is being investigated.

Plants with the translocation heterozygote were partially sterile, had much reduced pollen fertility, and reduced seed production. At MI, a ring of 4 chromosomes and 5 bivalents were present in the majority of the pollen mother cells (Pig. 1). At advanced MI stages, in a few PMCs, associations of 4 chromosomes and a free univalent along with 5 bivalents were also observed. The elimination of the 4th chromosome in these associations may be due to the availability of an extremely short chromosomal segment that is insufficient for chiasma formation and, therefore, one of the translocated chromosomes is unable to remain in this association. This inference is supported by the presence of many IV configurations occurring as open rings, chains, or zizags. Whereas the disjunction in the bivalents was normal at AI, the quadrivalent exhibited an anomalous disjunction. This led to misdistributions and fragmentations and laggard and bridge formations. However, a distribution of 6 + 8 was observed in nearly 40% AI cells during male meiosis. Besides, monocentric and dicentric bridges were also common at AI (Fig. 3, 4, 5). Second division stages were abnormal and the microspores with micronuclei were abundant. While the genetic tests indicated that these translocations were gene controlled, plants with a ring of 6 chromosomes were detected (Fig. 2) from the progeny of the translocation heterozygote hybrids. This points to the possibility that some other chromosome may be involved in the translocation as well. The translocation homozygotes are weak, inviable, and with small flowers and abortive seeds.

(1) Kaul, M. L. 11. 1978. Proc. XIV Int. Cong. Genet. Moscow. (Abstr.). Pt. 1, 29b p.



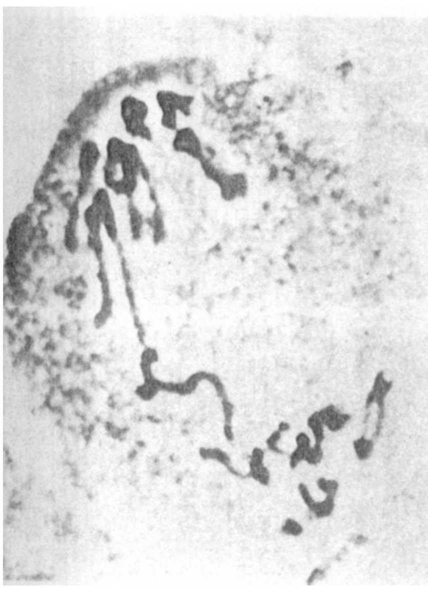


Fig. 1. 5 bivalents and a ring of IV chromosomes at MI.

Fig. 2. 4 bivalents and an open VI configuration at MI.

Fig. 3-4. Anaphase I - the very long arms represent the crossover chromatids of one of the chromosomes.

Fig. 5. Anaphase I bridge and misdistribution of chromosomes.