

3. Translocations between homologous chromosomes in maize.

Among the plants described in the previous section which were examined at diakinesis for the presence of interchanges, occasional samples were observed with nine bivalents and two separate globules of chromatin, each roughly half the size of a bivalent, but sometimes differing in size. Similar globules had been observed in experiments with X-rayed dormant barley seeds by Caldecott and Smith, (Cytologia 17:224-242. 1952), who thought that they originated from translocations between opposite arms of homologous chromosomes with the reunions involving homologous arms. These authors used the term "pseudo-isochromosome" to include two homologous arms, a centromere, and a short interstitial segment involving the opposite arm, as distinguished from a true isochromosome which has two homologous arms and is telocentric.

The frequency in the maize experiments of interchanges between homologous chromosomes for the combined X-ray and thermal neutron treatments was 18 out of 1636 samples (including the 1602 samples for the two irradiation series in table 2 and 34 samples from the X-ray treatments of 24,000r and 32,000r). The distribution of the 18 occurrences among treatments was as follows:

X-rays (r units)

4,000	1
8,000	4
32,000	1

N_{th} ($\times 10^{12}/\text{cm.}^2$)

17.3	1
18.9	5
24.8	1
31.4	4
41.7	1
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	18

The chromosomes involved have been identified in 11 out of the 18 samples and include chromosome 2 (two positive and two questionable identifications), chromosome 4 (one occurrence), chromosome 6 (three occurrences), chromosome 8 (two occurrences), and chromosome 10 (one occurrence). Pachytene observations indicate that in some cases the homologous arms of a pseudo-isochromosome pair regularly, with the centromere slightly subterminal, suggesting that a very short interstitial segment involving the opposite arm is present. In the case of chromosome 10 there was variability in pairing of homologous arms, with the centromere shifting from a terminal to a subterminal position in different cells. There was no association between the two pseudo-isochromosomes at pachytene, although at later stages they were sometimes seen in close proximity. Lagging of one or both pseudo-isochromosomes was fairly common at anaphases I and II. Further cytological work is in progress.

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