7. The production of large chromosome rings and a proposed use for studies of chromosome pairing relationships.

A method was proposed earlier (Maize News Letter #29, p. 55) for avoiding some of the high sterility encountered as the number of translocations in a stock is increased. One test has been completed. A homozygous stock which had combined translocations 2 - 4b and 4 - 8a was crossed with another that had combined 2 - 4b and 2 - 3d. As predicted, the F_1 had 2 rings of four chromosomes. Cytological examination of the progeny of this F_1 crossed with a normal indicated independent assortment of the "fertile" combinations from each of the two rings. One-fourth of the progeny had the desired ring of eight chromosomes (2 - 3d + 2 - 4b + 4 - 8a); one-half had a ring of six chromosomes (2 - 3d + 2 - 4b or 2 - 4b + 4 - 8a), and one-fourth had a ring of four chromosomes (2 - 4b). A stock homozygous for the three translocations can be isolated from the plant with the 08.

By using this method and by proper planning of the crosses of stocks with as many translocated chromosomes in common as possible, the predicted maximum pollen sterility should be about 75%. This is no greater for the production of a multiple translocation stock to produce a ring with all the chromosomes than for the production of the ring of eight.

8. Chromosome rings in which the homologous differential segments are in separate rings are theoretically possible.

In a species with an odd number of chromosome pairs, a single ring including all the chromosomes would be expected from a cross between a stock having a standard normal chromosome complement and a homozygous stock having a translocation on every arm of every chromosome of the complement. In a species with an even number of pairs of chromosomes it was demonstrated by diagrams that two rings of chromosomes are to be expected from such a cross and the corresponding homologous differential segments of each chromosome pair are in separate rings. The ten pairs of chromosomes of maize may be divided into two groups with an odd number of pairs of chromosomes. If a multiple translocation stock is produced with translocations restricted to chromosomal interchanges within the group and involving every arm, two rings of ten chromosomes with homologous centromeres in the same ring are expected in the pollen mother cells of the progeny from a cross with a stock having a normal arrangement of chromosomes. Comparisons between a multiple translocation stock that would produce progeny with two rings of ten chromosomes with homologous centromeres in the same ring, with a multiple translocation stock that would produce progeny with two rings of ten chromosomes with homologous centromeres in different rings, may reveal whether chromosome pairing during meiosis is more strongly governed by the mid-sections including the centromeres or by the distal portions of the chromosomes.

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