THE GENETICS OF AUTOTETRAPLOID MAIZE

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VII. SUMMARY

The frequency of recombination in two chromosome segments has been compared in diploid and tetraploid forms of maize. The segment between the sugary endosperm-1 and glossy seedling-3 loci includes the centromere of chromosome 4, whereas the other segment, bounded by the shrunken endosperm-1 and waxy loci, is located in the distal half of the short arm of chromosome 9.

Recombination in diploids was estimated from the backcross segregations of coupling phase heterozygotes.

Tetraploids heterozygous for these genes were produced. Fisher's methods were used to estimate linkage from their second backcross segregations. Methods were devised for the elimination of bias to the estimates of the recombination frequencies due to the differential viability of some gametic genotypes and first backcross phenotypes.

The difference between the recombination frequencies in the Sh Ex segment in diploid and tetraploid heterozygotes was small and not significant. However, in the Su G1 segment, recombination was significantly more frequent in tetraploids than in diploids.

These results were interpreted on the basis
of the differences in chromosome behaviour known to exist between the diploid and tetraploid forms of maize.

It is suggested that tetraploidy may increase the frequency of recombination in the proximal regions, but have little effect in distal segments of each chromosome in maize.

Estimates of the frequencies of double reduction at seven loci, and of the frequencies with which the three chromosomes bearing them undergo numerical non-disjunction, were biased by viability disturbances. The best estimates of double reduction were obtained from triplex backcross data by assuming that the effects of numerical non-disjunction and differential viability are equal and opposite. The results support the hypothesis that recombination in the proximal chromosome regions of tetraploids is more frequent than in diploids.

The effects of polyploidy on recombination in maize are compared with those in other species.