

Dose-response curves for the 48 hour series (46 and 51 hour irradiations), like those for the 31 and 37 hour series, increased at a power of the dose greater than one. Hence, though onset of mitosis at ca. 38 hours in cells comprising embryonic leaf primordia undoubtedly influenced their capacity to recover from radiation injuries, the principal determinant of radiosensitivity was apparently some change in physiologic state that affected the entire shoot system.

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1. The effects of progressive alterations in chromosome constitution on pachytene and metaphase trivalent frequencies in 21 chromosome plants carrying maize-Tripsacum interchange chromosomes.

Three secondary exchange products have been recovered from a 21 chromosome stock carrying a pair of maize-Tripsacum interchange chromosomes. In effect, the secondary exchanges approximately halved the extent of the Tripsacum segment (in the  $2^T$  chromosome), leaving either its distal region (carrying a terminal knob), or its intercalary region, as a substitution in chromosome 2, or returning its distal half to the  $T^2$  chromosome. These secondary exchange products were identified both by means of genetic markers and by cytological morphology and synaptic behavior.

Plants carrying the secondary exchange products were then crossed in a variety of combinations to give (so far) an array of eleven constitutions differing in duplication or triplication of corresponding chromosome regions, extent and position of segments of maize chromosome 2 in the  $T^2$  chromosome and also extent and position of segments of the Tripsacum chromosome in the  $2^T$  chromosomes. Trivalent frequencies at pachytene and metaphase I have been studied in all of the available constitutions.

Estimates of these frequencies at pachytene were remarkably similar to metaphase estimates throughout the entire array of constitutions. Furthermore in the case of one plant with exceptionally clear pachytene cells, where it was possible to classify 90 percent of 116 cells for presence of a trivalent or univalent, 52/104 (or 50 percent) contained a trivalent. In the unlikely event that all 12 of the unclassified cells actually contained a trivalent, the pachytene trivalent frequency was 55 percent. Of 221 metaphase cells from this plant, 96, or 43 percent, contained a trivalent from which the minimum frequency of cells with at least one chiasma (in the appropriate arm) per pachytene trivalent is inferred to have been about 43/55 or 78 percent. If the trivalent frequency in the 12 unclassified cells did not differ greatly from the

rest of the sample, then the minimum frequency of cells with at least one chiasma per trivalent was about 43/50 or 86 percent. The extent of homologous pairing available for crossing over in the pertinent region of these trivalent configurations is estimated to have included a maximum of 29 genetic map units. This estimate of genetic length is probably an overestimation since it is based upon a uniform cytological distribution of the genetic map although it is known to be somewhat more concentrated distally. Therefore, on the basis of these calculations, a chiasma frequency of less than 58 percent was expected where an actual minimum of 78 percent was found.

Thus it appears that either crossing over precedes and is required for pachytene pairing, or crossing over always, or almost always, follows synapsis of the regions studied in this experiment, even when their genetic length is considerably less than 50 units.

When estimated frequency of trivalents at metaphase is plotted against estimated cytological extent of homology in the  $T^2$  chromosome for regions present in either or both of the other chromosomes, points for the various chromosomal constitutions follow an interesting pattern of tight clusters. If the results are taken at face value, it appears that: (1) The frequency of trivalent formation is depressed by the presence of homologous regions in triplicate in a way which is relatively insensitive to the length of these triplicated regions. (2) The frequency of trivalent formation nevertheless increases with increase in the extent of homology in the  $T^2$  chromosome to either or both of the other two chromosomes. It also appears that the location of the terminal knob is unimportant, that terminal or intercalary position of a triplicated region makes no important difference, and that common homology to the  $T^2$  chromosome can be divided between the  $2^T$  chromosome and a normal chromosome 2 without significant change in trivalent frequency.

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1. Genetics of tillering.

A Pawnee stock and a grassy-tillered stock from E. G. Anderson, as well as Argentine Pop, were added to the forms being studied. The first crosses are expected to be ready for analysis this coming season.

2. Effects of maleic hydrazide and indole butyric acid on nana-1.

Eight plants, suspected of being homozygous for  $na_1$  but all 5 feet tall, were backcrossed to  $na_1$  in 1962. Seed from each produced some tall plants, so the conclusion was that the treatment had not caused the increase in height. Repeated in 1963 on homozygous  $na_1$  plants, internodal elongation did occur in three out of five plants treated with MH (100