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1. Spontaneous losses of chromosome 3 markers associated with a translocation.

On kernels expected to be colored and fully round from the cross of $\underline{a_1}\,\underline{sh_2}/\underline{a_1}\,\underline{sh_2}$ (female) by $\underline{A_1}\,\underline{Sh_2}/\underline{A_1}\,\underline{Sh_2}$ (male), colorless-shrunken sectors ($\underline{a_1}\,\underline{sh_2}$ phenotype) appeared with a high frequency. The male parent originated from a cross of the many-knobbed Maiz Chapolote strain to a knobless flint, and consequently was heterozygous for a number of knobs. The female parent represents a standard tester line. In three successive tests using selected sectored kernels as male parents on the $\underline{a_1}\,\underline{sh_2}$ tester, sectored kernels were observed among the progeny.

Sector size (i.e. that of the $\underline{a_1}\,\underline{sh_2}$ phenotype) was found to be uniform and relatively large, indicative of an early event in endosperm development. (Small sectors, indicating a late event, were found to be non-heritable).

The frequency of kernels showing sectors varied in the different crosses. In $\underline{a_1}\,\underline{sh_2}/\underline{a_1}\,\underline{sh_2}$ (female) x $\underline{A_1}\,\underline{Sh_2}/\underline{a_1}\,\underline{sh_2}$ (male) crosses, where only one-half of the progeny (the $\underline{A_1}\,\underline{Sh_2}$ types) could show losses, the frequency of sectored kernels varied from 0% to $>$ 25%. In the examinations of various tested selections the frequencies were not homogeneous. Frequency peaks were found at 40% and 49%. It appears therefore that the sectoring is heritable.

Cytological observations of PMC's taken from plants used as the male parent show eight typical bivalents and a chain configuration in diakinesis. The latter (chain-of-four) is also observed in Metaphase I and indicates that two chromosomes are involved in a translocation present in heterozygous condition. A very distal breakage point in one of the chromosomes involved would account for the chain-of-four configuration instead of a ring-of-four. After examining sporocytes of a large number of progeny from the colored-round kernels from the cross given above, a correlation was found to exist between the presence of the chain in diakinesis and the appearance of sectored kernels among the progeny of the same plant. It appears, therefore, that the translocation is related to the sectoring behavior.

From pachytene analysis the translocation was shown to involve chromosomes 1 and 3 with the break in chromosome 1L at approximately .95 and the break in 3L at approximately .35. The detection of a break at .95 is in agreement with the open configuration (chain-of-four) observed in diakinesis. An extremely long chromosome (1^3) results from the translocation described, and a medium-sized knob is present in 1S while a large knob is carried by the segment of chromosome 3L translocated to 1L. The markers, $\underline{A_1}\,\underline{Sh_2}$, are located in the knobbed 3L segment. It is suggested that the abnormal length and structure of chromosome 1^3 interfere with its normal replication and are therefore the cause of correlated phenotypic changes ($\underline{A_1}\,\underline{Sh_2}$ losses) observed in the endosperm.

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2. Evidence for instability of a tetrasomic condition.

In last year's Maize News Letter, data were reported on the transmission of the chromosome B^4 when it is present as a single supernumerary chromosome in the plant. This chromosome, which carries the dominant marker Su, was originally extracted from TB-4a and transferred into normal stocks ($\underline{su_1}$ testers) where its transmission can be observed by the Su marker.

Plants with two B^4 chromosomes were obtained in the field (summer 1967) and in the greenhouse (spring 1968) after selfing plants with the genotype: $4\underline{su}$, $4\underline{su}$, $B^4\underline{Su}$. The question then was raised as to whether the transmission of the chromosome B^4 would be affected by the presence of two such chromosomes, since a more regular pairing and disjunction is expected to result when the B^4 has an identical partner as in the genotype: $4\underline{su}$, $4\underline{su}$, $B^4\underline{Su}$, $B^4\underline{Su}$.

Reciprocal crosses as well as selfings of the given genotype were then made to a $\underline{su_1}$ tester. The results are reported in Table 1. Nine ears only were obtained in one series of crosses (top row), because most of these short plants (due to the tetrasomic condition of 75% of the short arm of chromosome 4) were destroyed by muskrats during the milk-stage.