2. Chromosome arm differences between corn and Tripsacum.

Two cases have appeared where genes on one arm of a corn chromosome correspond to a different Tripsacum chromosome than those from the other arm. These involve the arms of chromosomes 2 and 4. The results from two species of Tripsacum, T. dactyloides and T. floridanum, were identical.

In the case of chromosome 2 of corn, the v_4 locus on the long arm has a dominant counterpart in Tripsacum on a different chromosome than the short arm genes lg_1 gl_2 as well as a third locus, ws_3, tested by Maguire (1962). In our "addition monosomic" (20+1) stocks on lg_1 gl_2 v_4 corn, the extra chromosome from Tripsacum has dominants which covered only lg_1 gl_2 but never v_4 in some stocks, while in other stocks the v_4 locus is covered but never lg_1 gl_2.

Maguire (1962) noted that while the three loci (ws_3, lg_1, gl_2) are on the short arm of a corn chromosome, they are on the long arm of a Tripsacum chromosome. This agrees with our location of the v_4 locus on a different Tripsacum chromosome than the other three genes mentioned. Apparently an ancient removal of all or part of the v_4 locus arm from the original chromosome 2, changed the relative length relationships of its armsin present day Tripsacum, at least in T. dactyloides and T. floridanum.

In the case of chromosome 4 of corn, the su_1 locus on the short arm has a dominant counterpart in Tripsacum on a different chromosome than the gl_3 locus on the long arm. Thus, as in the previous example, the extra chromosome originally from Tripsacum can cover sugary but not glossy-3 whereas a different extra chromosome in other stocks covers glossy-3 but not sugary. Furthermore, the Gl_3^T chromosome of Tripsacum has been observed by Chaganti to be smaller and distinct from the Su_1^T chromosome of Tripsacum.

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3. Gross translocations or fragmentation in Tripsacum chromosomes?

In discussing Tripsacum as a possible ancestor of modern corn, Cutler (Lloydia 10:229-234, 1947) mentions that the chromosome number in present day Tripsacum

could have been increased from 10 to 18 by either duplication or fragmentation. We have already ruled out duplication on a basis of the transmission rate of dominantly marked Tripsacum chromosomes onto seven recessively marked corn chromosomes in the "WMT" stock and also on a basis of the number of Tripsacum chromosomes which are unmarkable in terms of the "WMT" marker genes.

If our hypothesis that Tripsacum is an amphidiploid of wild corn and Manisuris is correct, then we may also rule out fragmentation. The fact that some of the Tripsacum chromosomes, which are unmarkable in terms of the "WMT" genes, have Manisuris-like effects supports this hypothesis (MNL 38: 50-51, 1964). However, the data presented in the previous item suggests that some translocations involving entire arms of chromosomes have occurred and have set the stage for introgressive evolution. Following an introgression of this "manisuroid" germplasm into corn, two forms of selection have yielded two distinct products. Teosinte is the product of natural dissemination and modern corn is the product of dissemination by man.

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4. Possible unreduced eggs in corn x T. floridanum hybrids and hybrid derivatives.

The success in making the first backcross of a corn-Tripsacum hybrid to corn is dependent upon the production of unreduced eggs by this hybrid. In the case of our WMT corn x T. dactyloides hybrid, we had to resort to doubling the chromosomes with colchicine in order to get these fertile, "unreduced-type" eggs. But corn x T. floridanum hybrids are highly fertile without doubling the chromosomes and this has led Chaganti to suspect that this species may contain a factor similar to the elongate gene which causes unreduced eggs in corn.

This suspicion has been strengthened by the peculiar nature of a segregation involving T. floridanum chromosomes. Although the transmission rate for the homeolog to the short arm of chromosome 2 from T. dactyloides has remained constant at about 23% for four generations, a much higher transmission frequency as well as some large off-type plants have occurred in the second backcross to corn of a lg_1 gl_2 v_4 x T. floridanum hybrid. The increase in transmission over that expected for the random segregation of a Tripsacum chromosome corresponds to the frequency (25%) of these large plants, as shown in the table. They are highly suggestive of their 3n parent