

The results shown above are regarded as conclusive evidence that the differences between the 11a, 11b classes and inbred 203 are real. Although no comparable data are given for the Tripsacum parent of these derivatives, it is common knowledge that their deviations from inbred 203, as shown, are consistently in the direction of diploid Tripsacum dactyloides.

Also, the deviations of 5601 and 5602 from inbred 203 are statistically significant for certain characters, but the significance is less pronounced. In all such instances except one, these deviations are again in the direction of Tripsacum. The exception is number of rows of alleles, 203 vs. 5601, B₅, which is undoubtedly explainable by the known fact that inbred 203 contains a little genetic variation for this character.

3. Occurrence of genes for sugary and white cob among the hybrid derivatives.

The endosperm of inbred 203 is starchy and the cob is red. The endosperm of Tripsacum also is starchy in phenotype, and the rachis might be classed as white (at least without red pigment).

In 1955, one ear of each of 31 multiple-eared B₃ plants of 11a and 11b was outcrossed to homozygous su₁ maize stocks, and five plants distributed among the two groups produced a total of 29 grains classified as starchy and 31 classified as sugary. The two types of grains were extremely difficult to classify, however, because most of them which showed any similarity to sugary had lobes of starch, and many which finally were classified as sugary were primarily starchy with a minute area of sugary endosperm at the apex only one to two millimeters in diameter.

The su pollen applied to six of the 11a and seven of the 11b plants was also pure for white cob. The offspring of six of the 11b plants segregated for white cob, but none of the 11a offspring segregated. In 1957, several hundred F₁ plants resulting from outcrosses of 11a with a white-cob stock were grown, and no white-cob plants were among them. It may be concluded, therefore, that the gene for white cob was present in 11b but not in 11a.

Before making any attempt to explain the origin of the genes for sugary and white cob in these stocks, the chance that they entered by accidental contamination should be dealt with. The probability of contamination is reduced to nil by the following facts: These hybrid derivatives did not produce silks until very late in the season; the F₁ and the first two backcross generations, in particular, never produced their first silks until the other maize stocks had finished shedding pollen. The sweet corns planted in this area are even earlier than the other types, and they were approaching maturity when silks of

these F₁ to B₂ hybrids made their first appearance. Special late plantings of inbred 203 had to be made to provide pollen for these early generation hybrids. Regardless of this, better than ordinary precautions were always taken to protect the hybrids from possible contamination. None of the early generation hybrid derivatives have shown any character, except sugary and white cob, to suggest parentage other than inbred 203 and Tripsacum, and it has not been found possible to recognize the heterozygotes for sugary and white cob in any generation by phenotype. None of the early generation hybrids showed special vigor, such as to indicate hybrid vigor, although rogues did rarely occur in the B₄ and B₅ generations and were destroyed.

The explanation of the occurrence in these plants of genes for sugary and white cob probably is either (a) mutations induced by the original species hybridization or (b) the exchange of genes from Tripsacum chromosomes to maize chromosomes in an early generation after the original hybridization, followed by a loss of the Tripsacum chromosomes bearing the maize alleles. This last suggestion may seem bold, especially as applied to the su gene. Although the endosperm of Tripsacum is starchy in phenotype, Mangelsdorf and Reeves showed in 1939 that Tripsacum has a gene allelic with su₁ in maize, which is not completely dominant to the maize su₁ allele. The difficulty found here in classification also parallels that reported in 1939.

For the observed frequencies of five heterozygous and 26 homozygous plants, neither the hypothesis of a 1:4 nor that of a 1:7 ratio need be rejected. This makes difficult any attempt to estimate which generation, if any, after the initial hybridization was entirely heterozygous. Added to the difficulty are the recorded facts that all of the hybrid derivatives are descendants of one B₁ plant and that 11a and 11b each descended from one offspring of that B₁ plant. It is a reasonable estimate that each of the B₂ plants produced 12.5 to 25 percent of su gametes.

The observed frequencies of six plants heterozygous for white cob to one homozygous red, among the 11b B₃ plants, serve only to create doubt that the gene for white cob is similar in behavior to that for sugary.

In any event, complete pedigrees have been kept of all plants of 11a and 11b, and this will continue to be done. The seeds of the segregating plants originating from them are being recorded separately, so that if the necessity arises of treating them as a separate group from the non-heterozygotes, this can be done conveniently.

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