

Table 1. Continued.

Analysis of Variance			
Source of Variation	d.f.	s.s	M.S.
Total	20	24.383	
Between treatments	6	13.916	2.319*
Error	14	10.467	.748

*Significant at the .05 level.

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1. Maize-Tripsacum hybrids.

Hybrids between Texas inbred 203 and diploid Tripsacum dactyloides backcrossed to inbred 203 for five generations are under study, and the results obtained thus far are different in certain respects from any yet reported. Two related groups of the hybrid derivatives may be recognized on the ground that the phenotypic differences between them are significant for certain characters. One peculiar feature of both groups is that, in spite of their being fifth generation backcrosses, above 99 percent of the plants are completely pollen sterile and about 90 percent ovule sterile.

Although most of the work done to date is genetical in nature, cytological examinations have been made on about half of the nearly sterile B₃ plants of each group, and every plant examined was found to have an extra chromosome. Many of them also showed a chromatin tie and occasionally other irregularities. The plants of inbred 203 used in the work contained no B-chromosomes, and the Tripsacum had only the usual 18 pairs, characteristic of the diploid forms. Much additional cytological work is needed, but a tentative conclusion that most or all of the nearly sterile plants are 2n+1 is justified.

2. Characters of hybrid derivatives having only inbred 203 in their maize ancestry.

In 1955, 45 B₃ plants which had inbred 203 as their only source of maize ancestry were grown to maturity; in 1956, 290 B₄ plants; in 1957, 84 B₅ plants. Of these 419 plants only three had fertility approaching normal. These three plants produced pollen in abundance, and their ears were approximately filled with grains. However, their pollen,

including that of the S_1 progeny of two of them, was from 25 to 50 percent defective.

Most of the nearly sterile plants have less vigor than inbred 203, but they are strong enough that with only standard nursery care there is little or no danger of losing the stocks. Data have been recorded on 17 characters by which comparisons can be made in all combinations between inbred 203, S_1 progenies of two of the almost normally fertile hybrid derivatives and the two groups of nearly sterile hybrid derivatives. Both the hybrid derivatives and their Tripsacum ancestor are smaller plants than inbred 203, and most of the measurements taken on them result in lower values. But there is a mere possibility that this tendency in the nearly sterile derivatives is simply a component of their general lack of vigor, attributable to the $2n+1$ condition rather than to particular genes on the extra chromosome. For the time being, therefore, the data to be presented will be restricted to a few selected characters which would not be expected to respond, as they have done, to a mere decrease in vigor. Before presenting the data, a few notes of explanation are needed on the pedigree numbers in use.

Inbred 203. Isolated about 25 years ago for agronomic use; contains but little genetic variability.

11a and 11b. The two main groups of nearly sterile derivatives of a 203-Tripsacum cross, backcrossed to 203 five times prior to 1957; completely pollen sterile and about 90 percent ovule sterile.

5601. An almost normally fertile sib of 11a; few, if any, of the S_1 plants with an extra chromosome; ears normally filled with grains, but pollen 25 to 50 percent defective.

5602. Similar to 5601, except that it is a sib of 11b.

Nerve indices shown in the tables are numbers of nerves in the leaf blade per inch of width, with the measurements taken to the nearest $1/8$ of an inch.

Mean values for three plant characters of Inbred 203 and of two sterile derivatives of inbred 203 x Tripsacum dactyloides ($2n$), third and fourth backcrosses to inbred 203; all combinations compared.

Pedigree	No. rows alicoles		Leaf length/width		Days to maturity	
	B_3	B_4	B_3	B_4	B_3	B_4
203	6.48**	6.36**	7.65	7.83**	119 ¹ **	106 ¹ **
11a	4.38	4.13	7.60	8.97	132 1.9	120 2.0
203	6.48**	6.36**	7.65**	7.83**	119 ¹ **	106 ¹ **
11b	4.38**	4.18**	9.58**	9.48**	126 0.4	122 0.5

** Differences between means significant at the .01 level.

¹ Age at which all plants of inbred 203 were mature.

Table continued.

Pedigree	No. rows alicoles		Leaf length/width		Days to maturity	
	B ₃	B ₄	B ₃	B ₄	B ₃	B ₄
11a	4.38	4.13	7.60**	8.97*	132*	120**
11b	4.38	4.18	9.58**	9.48*	126*	122**

** Differences between means significant at the .01 level.

* Differences between means significant at the .05 level.

Mean values for four plant characters of inbred 203, of two almost normally fertile derivatives of (inbred 203 x Tripsacum dactyloides-2n) x 203₄, and of two nearly sterile derivatives of (inbred 203 x Tripsacum dactyloides-2n) x 203₅.

Pedigree	No. rows alicoles	Leaf length/width	Nerve index	Days to maturity
203	5.96*	7.36	5.41	105**
5601	6.30*	7.52	5.59	108**
203	5.96	7.36**	5.41*	105
5602	5.81	8.64**	5.78*	107
203	5.96**	7.36**	5.41**	105**
11a	4.19**	10.45**	6.98**	119**
203	5.96**	7.36**	5.41**	105**
11b	3.91**	9.52**	6.52**	110**
5601	6.30**	7.52**	5.59	108
5602	5.81**	8.64**	5.78	107
5601	6.30**	7.52**	5.59**	108**
11a	4.19**	10.45**	6.98**	119**
5601	6.30**	7.52**	5.59**	108
11b	3.91**	9.52**	6.52**	110
5602	5.81**	8.64**	5.78**	107**
11a	4.19**	10.45**	6.98**	119**
5602	5.81**	8.64	5.78**	107
11b	3.91**	9.52	6.52**	110
11a	4.19	10.45*	6.98*	119**
11b	3.91	9.52	6.52	110

** Differences between means significant at the .01 level.

* Differences between means significant at the .05 level.

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