CONNECTICUT AGRICULTURAL EXPERIMENT STATION
New Haven 4, Connecticut

1. Further tests for identity of different sources of sterile cytoplasm.

The 1960 MNL (p. 13) reported our results of preliminary genetic tests to compare nine (our types A-I) additional sources of sterile cytoplasms with S and T types. In the same MNL (p. 21) Buchert reported tests on the same nine sources. Evidence from both series of tests indicated that the nine independent sources carried S type cytoplasm. The origins of the nine new sources are given in the 1960 MNL (p. 14).

In 1960 two additional genetic tests were conducted which support the earlier findings. Each of the new sources of sterile cytoplasm is in process of being combined with the genotypes of inbreds A158 and WF9, from 2 to 10 backcrosses having been made to date. The A158 series of steriles was crossed by NY16, a restorer for both S and T. As previously reported, however, restoration in types A-I was approximately 50%. This was taken as evidence that all nine cytoplasms were S type, since according to Buchert's findings on the behavior of S restorer genes in heterozygous condition (MNL, 1959), pollen grains with the non-restoring allele abort and restoration is thus only 50% in the presence of S cytoplasm. In contrast, restorer genes for T type cytoplasm give close to 100% restoration when heterozygous. It was pointed out in the previous report that if the A-I restored steriles do have S cytoplasm and typical S restorer genes they should give all fertile offspring when crossed as pollen parents to the appropriate A158 A-I sterile seed parents, but should segregate sterile and fertile when crossed as seed parents by normal A158, since gamete selection occurs in the pollen but not in the egg cells. Accordingly, each of the F_1's between the A158 A-I steriles and NY16 was used as pollen parent on the corresponding A158 sterile, and as seed parent in crosses with normal A158. In each case the same restored sterile F_1 plant was used as male and female parent. For each restored single cross the left column in table 1 gives the results when the restored single cross was used as seed parent, and the right column when it was used as pollen parent. As seen from the table the expected results were obtained except for families of A158G and A158H, each of which gave one sterile plant when the restored F_1 served as male parent. These same families, however, also contained some partially restored types. Evidently, the restorers from NY16 were less effective in combination with the residual genotype of A158G and A158H, and it is probable that the two plants classified as sterile did have the major S restorer gene from NY16.

The second genetic test for characterization of the new sources of sterile cytoplasm involved the use of A158 restored lines previously shown to carry exclusively S or exclusively T restorers. These tester lines of A158 originally carried both S and T restorers from Ky21, but

by repeated backcrosses to one type of cytoplasm restorers for the other type were lost. Thus each of the A158 steriles was crossed by A158TF4 (carrying T restorers only) and by A158SF5 (carrying S restorers only). Both the TF and SF restorer lines were homozygous for the restorer genes. The results are listed in table 2. In addition to the A-I steriles, this test also included sterile cytoplasms J, K and L, and an M14 with sterile cytoplasm from Reid's yellow dent obtained from Iowa. This test confirms that sources A-I, as well as sources K and L, and the Reid sterile contain S type cytoplasm.

Source J, which came from a Bolivian variety, is apparently T type, since it was not restored by the A158SF tester. Other evidence for this is the fact that the Bolivian variety which furnished the J cytoplasm had T, but not S, restoring genes. Further, heterozygous J type restored steriles (with the restorer from the Bolivian variety) are approximately 100% rather than 50% fertile.

Table 1.

	♀ x A158			A158 sterile (A-I) x ♂		
	F	S	PF	F	S	PF
A158S12 x NY16	8	11	1	21	0	0
A158A6 x NY16	15	6	1	19	0	0
A158B8 x NY16	12	7	1	17	0	0
A158C5 x NY16	13	6	2	21	0	0
A158D1 x NY16	13	5	3	21	0	0
A158E4 x NY16	13	8	0	18	0	0
A158F3 x NY16	11	9	1	21	0	0
A158G x NY16	9	10	0	10	1	5
A158H x NY16	12	9	1	11	1	5
A158I x NY16	13	6	0	19	0	1

Table 2.

	A158TF4 #10♂			A158SF5 #19♂		
	F	S	PF	F	S	PF
A158T8	20	0		0	18	
A158S13	0	22		17	0	
A158A7	0	18		19	0	
A158B9	0	19		20	0	
A158C6	0	19		20	0	
A158D2	0	17		9	0	8
A158E5	0	19		19	0	
A158F4	0	20		18	0	
A158G1	0	16		21	0	
A158H1	0	20		18	0	
A158I1	0	20		18	0	
A158J3	-	-		0	15	
A158K1	0	19	1	19	0	
A158L1	0	23		16	0	4
M14 Reid sterile	0	21		20	0	

Harry T. Stinson, Jr.