5. "Kys" male sterility.

In the 1956 News Letter a case of male sterility was reported in which the male sterile plants first occurred in a backcross of as/ Kys egg parents to Kys. On further analysis it appears that this occurrence of male sterility is simply another instance of the so-called "Kys" male sterility, which appears in the second cross to Kys (with Kys as pollen parent) of any strain of Ms __ S __ constitution. The data presented below are consistent with a two factor system in which Ms __ s s types are male sterile and Kys is homozygous for both recessives. Moreover, plants of Ms ms S s genotype produce 50% partially filled pollen as was observed by Bauman in his study of the Kys male sterility. The only discrepancy to date between my results and those reported by others working with Kys male sterility is the progeny of a single selfed plant which segregated male steriles. None of the genotypic combinations of the Ms and S factors would be expected to give male sterile plants in the F_2 because the s allele is not transmitted through the pollen by Ms ms S s plants. The F_2 populations examined in the field in 1956 did not segregate male sterility, but none were duplicates of the aberrant population mentioned above.

An adequate test of a cytoplasmic effect has not yet been completed in the present case. Leng and Bauman (1955) and Ogle (1956 News Letter) have shown that no cytoplasmic sterility is involved in the Kys male sterility. This is undoubtedly true in the present case also, especially since plants with "partial" pollen occur in the progeny of Kys X Ms ms S s as well as in the progeny of Ms ms S s X Kys where the Ms ms S s egg parent was derived from as/Kys X Kys. In the former cross the cytoplasm was from normal Kys and in the latter it came from the asynaptic stock.

Results of crosses of Ms ms S s and Ms ms s s egg parents by ms ms s s (Kys) pollen.

	Normal	Male sterile
Ms ms S s		
	79	25
	8	5
	21	12
	23	6
	18	10
	24	10
	19	12
	6	3
	75	16
	59	32
	58	21
	390	172
Expect (3:1)	421.5	140.5

	Normal	Male sterile
Ms ms s s		
	46	27
	33	34
	19	21
	31	24
	129	106
Expect (1:1)	117.5	117.5

Simultaneous tests in which male sterile plants were classified:

		♀ B.C.	♂ B.C.	as ♂ X MS sib	⊗
Ms ms S s	19147 (2)	75 N: 16 MS	all N	all N	-----
	19147 (12)	59 : 32	all N	all N	-----
	19147 (47)*	---------	all N	all N	all N
	19147 (54)*	---------	all N	all N	all N
		Σ = 134 48			
		Expect (3:1) 136.5: 45.5			
ms ms S s	19147 (13)	---------	all N	65 N: 26 MS	all N
	19147 (34)	all N	all N	63 : 12	-----
				Σ = 128 38	
				Expect (3:1) 124.5: 41.5	
ms ms s s	19147 (5)	---------	-----	29 : 54	all N
	19147 (30)	---------	all N	45 : 47	all N
				Σ = 74 :101	
				Expect (1:1) 87.5: 87.5	

* Genotypes of these plants were determined after examination for "partial" pollen.

Classification for "partial" pollen:

		♀ B.C.	♂ B.C.	as ♂ X MS sib	♀
Ms ms S s	19147 (47)	------	35 N: 56	19 N: 68 : 0 MS	54 N: 34
	19147 (54)	------	37 56	9 13 1	47 20
	17150	------	------	9 27	------
	17150	------	------	16 28	------
	19151 (3)	------	------	----------	27 11
	17150 (94)	------	------	----------	36 23
			Σ = 72 :112		
		Expect (1:1) -- 92 : 92	Σ = 53 :136	: 1* Σ = 164 : 88	
				Exp.	
			Expect (1:3) -- 47.3: 141.7	(5:3) -157.5: 94.5	
ms ms S s	19151 (1)	------	------	----------	33 : 0
	19151 (2)	------	------	----------	40 0
	19147 (34)	all N	all N	41 : 22 :12	------
			Expect (2:1:1) -- 37.5: 18.7: 18.7		

* Probably due to contamination.

In the above 2 tables, all columns labelled B.C. refer to backcrosses to Kys.

Pollen grains from Ms ms S s and Ms ms s s plants were stained with carmine and examined. In Ms ms S s samples, about half the grains are normal in appearance and half are smaller and partially filled with starch. The latter presumably are of Ms s and ms s constitution. Some of the small grains contained two sperm nuclei and a vegetative nucleus while others apparently had only one nucleus. In Ms ms s s samples, there is no normal pollen and none of the grains contains starch. Some of the cells have a single nucleus and others show signs of degenerate nuclear material. Both S and Ms may produce a transient conditioning of the cytoplasm of the microspores. Grains of identical genotypes (Ms s and ms s) are present in the two samples examined yet in the Ms ms S s sample the abortive grains are much more normal in appearance. This difference may be due to the action of the S factor. Moreover, the ms s genotype in itself cannot produce abortion in the microspore since normal Kys pollen is of this constitution. It would seem that the Ms factor also has a conditioning effect on the cytoplasm of the PMC prior to meiosis which determines whether a microspore of ms s constitution will be entirely normal or will abort.

Ellen Dempsey

6. Heterotic effects of a chromosomal segment.

Tests for heterotic genes in the long arm of chromosome 3 were continued in 1956. A homozygous inversion 3a strain carrying the recessive a_1 allele in the inverted segment was crossed to a number of inbred lines with the A_1 allele. F_1 plants, all heterozygous for the inversion and for A:a, were backcrossed by the recessive a_1 inversion stock. On the F_1 backcrossed ears there was a ratio of 1 colored: 1 colorless kernels. The colored kernels are heterozygous for the inversion and for A:a and the colorless kernels homozygous for the inversion and for a:a. The kernels of the 2 classes were planted in replicated plots. Data for grain yield, ear height, kernel weight, ear number, and maturity are given in the following tables: