2. Inheritance studies on the "Kys" male sterility.

As originally reported by Schwartz (Genetics 36:676-696. 1951) male sterile plants of the "Kys" sterile have (1) sterile cytoplasm, (2) dominant Ms gene, and (3) recessive suppressor gene s^{ga}. The alternative condition of any one of these factors would give normal fertile plants. Upon further testing it appears that a "specific" cytoplasmic factor is not involved or is not necessary for the expression of male sterility (Agronomy Journal 47:189-191. 1955).

Schwartz also reported that the suppressor gene ($S^{ga}s^{ga}$ exhibited male gametophyte competition, i.e., recessive s^{ga} pollen could not compete with dominant a pollen. The writer (Abstract paper 1953 Agronomy meetings) found that plants with the Ms gene and heterozygous for $S^{ga}s^{ga}$ could be identified by the presence of 50% of the pollen being partially filled with starch. The partially filled pollen grains (s^{ga}) abort and do not germinate.

Further tests revealed that apparently pollen of msms $S^{ga}s^{ga}$ plants was normal and crosses showed transmission of recessive s^{ga} through the pollen to be regular. Therefore, it was only in the presence of dominant Ms that s^{ga} pollen was partially filled with starch and failed to germinate. The expression of partially filled pollen was not affected by different cytoplasms. Since a male gametophyte factor was not involved in the accepted sense, the ga superscript may possibly be eliminated.

Segregation of both genes is normal on the female side. The recessive s is not transmitted through the pollen in plants having Msms Ss genotype. Several examples of the results obtained and the theoretical pollen classification of the resulting plants are given below. Pollen classification of the parent plants is given in parentheses below the genotype.

Pedigree		Resulting Plants	
Msms Ss	x msms Ss	Msms ss	1 male sterile
(Partial)	(Normal)	Msms Ss	2 partial pollen*
		Msms SS	1)
		mm SS	1)
		mm Ss	2) 5 normal pollen
		mm ss	1)
Msms ss	x msms Ss	Msms ss	1 male sterile
(Male sterile)	(Normal)	Msms Ss	1 partial pollen*
		msms Ss	)2 normal pollen
		msms ss	)
MsMs Ss	x msms ss	Msms ss	1 male sterile
(Partial)	(Normal)	Msms Ss	1 partial pollen*
		msms Ss	)2 normal pollen
		msms ss	)
MsMs SS	x msms Ss	Msms SS	normal pollen
(Normal)	(Normal)	Msms Ss	partial pollen*

MsMs SS	x Msms Ss	MsMs SS	)Normal pollen
(Normal)	(Partial)	Msms SS	)
Msms Ss (x)		MsMs Ss	1) 3 partial pollen*
(Partial)		Msms Ss	2)
		MsMs SS	1)
		Msms SS	2)
		msms SS	1) 5 normal pollen
		msms Ss	1)

*50% pollen partially filled

This last cross, giving an expected 5:3 ratio or 37.85% partially filled pollen plants in the F_2, would explain the results from Nebraska in the 1955 Newsletter in which case they reported 31% of the F_2 plants had partially filled pollen.

Apparently some inbreds carry modifiers affecting the expression of the Kys sterile. Classification of partially filled pollen plants was difficult in some crosses. Crosses involving inbred M14 were irregular, but since these stocks were left at Illinois I have not been able to verify its behavior.

In summary, (1) the Kys sterile is apparently not dependent on a "specific" sterile cytoplasm, (2) Msms ss or MsMs ss plants are male sterile, (3) recessive s is not transmitted through the pollen in Msms Ss or MsMs Ss plants, (4) in segregating populations, Msms Ss or MsMs Ss plants can be identified, with a reasonable degree of accuracy, by the presence of 50% of the pollen grains partially filled with starch, and (5) pollen production and transmission of s is normal in msms Ss or msms ss plants.

Loyal F. Bauman