4. Further report on relationships between cytoplasmic and genic male sterility.

Jones has earlier reported (MNL. 1954, p.20; Brookhaven Sym. in Biol. No. 9, 1956) the results of crosses which clearly indicated independence between restorer genes for cytoplasmic male sterility and the conventional ms genes. Dominant restorer genes did not act as dominant Ms_1 genes when crossed to ms_1/ms_1 male sterile plants. Jones also pointed out that Ms genes obviously do not act as restorer genes for sterile cytoplasm, since the former genes are present in all normal inbreds which have been converted to cytoplasmic male sterility. Further evidence on the independence of the cytoplasmic and genic male sterile systems comes from crosses which placed an ms_1/ms_1 genotype in plants carrying S type cytoplasm plus restorers for S cytoplasm.

Fertile plants of A158SF4-1A (S type cytoplasm, restored by Ky21 restorer, backcrossed four generations to A158, followed by one generation self) Y Ms_1/Y Ms_1 were pollinated by Y Ms_1/y ms_1 males in a WF9 genotype. All F_1 plants from this cross (ca. 15 plants) were fertile, indicating that the female parent was homozygous for the S-restorer, since the Y Ms_1/y ms_1 male parent was in a WF9 background and presumably carried no S restorers. The F_1 plants, then, possessed S cytoplasm and were heterozygous for the restorer genes. In addition, 50% of the F_1 plants were heterozygous Y Ms_1/y ms_1 (ignoring X-overs). The F_1 plants were selfed, and white (or light yellow) seeds from ears segregating yellow-white endosperm color were planted.

The white seeds should give rise to y ms_1/y ms_1 plants in S cytoplasm, except for X-overs (4-5%). Since the F_1 plants were heterozygous for the S restorer gene, 75% of the y ms_1/y ms_1 plants should have carried the restorer gene. Actually, according to Buchert's findings on the male transmission of S restorers in A158SF families (MNL 1958, p.15) all of the y ms_1/y ms_1 plants would possess the restorer gene, since only the restorer allele is transferred through the pollen. If the S restorer gene prevented the ms_1 gene from expressing itself, or if ms_1 were not capable of acting in S cytoplasm, at least 75%, and probably 100%, of the y ms_1/y ms_1 plants would be expected to be fertile. In fact, out of a total of 46 plants in two progenies, 43 plants were completely sterile and only 3 normal fertile (6.5% fertile). The proportion of fertile plants is about that expected as a result of X-overs between the y and ms_1 loci plus hetero-fertilization and mistakes due to misclassification of light yellow endosperm. It is concluded, therefore, that ms_1/ms_1 plants with S cytoplasm and S restorer genes are sterile; the ms_1 gene is not inhibited by S restorers, by S cytoplasm, or by a combination of both.

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5. Inheritance of a chlorophyll defect in a male fertile WF9S stock.

Previously reported (Jones, MNL 28, p.19; MNL 29, p.14) was a case