3) Significant and positive correlations were found between mid-parent and F_1 means (.7526, .4214 and .5711).

4) Significant and positive correlations were found between inbred means and "general inbred means" in two groups (.8665 and .6551) and nonsignificant but positive in a third group (.5274). "General inbred mean" is mean performance of an inbred in F_1 crosses.

5) Predicted double cross performance was correlated with actual performance. Three prediction methods were used: Jenkins' methods B and C and inbred method E. Method C gave the highest correlations and inbred method E, in general, gave the poorest.

6) Components of variance were estimated from F_1 data in diallel cross analysis. General combining ability was found to be approximately twice the size of specific combining ability in two groups and equal in size in a third group. Additive variance (assuming no epistasis) was found to exceed dominance variance by 1.60, 4.68 and 5.38 times in three groups, respectively. Partial dominance was indicated in two groups and over dominance in a third group. The diallel procedure was used as developed by Matzinger and Kempthorne (Genetics 41: 822-833. 1956). The inbred lines in each group were not random lines from a random mating population, an assumption required by the analysis. It seemed worthwhile, however, to complete the analysis and to interpret the estimates with caution.

7) Constant parent regression analysis as proposed by Hull gave results indicating partial dominance.

8) Heritabilities estimated from F_2 and backcross data ranged up to 66.8 percent; however, only 60 percent of the estimates were positive. Mean heritability was approximately 21 percent when the negative estimates were assumed to be zero.

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1. Temperature mutant.

A new allele of the st gene has been found, which manifests its mutant effect only in the endosperm. This allele, designated st^e,

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shows dominance over st. When st^e/st^e plants are grown in the field in the summer and selfed, every kernel shows the mutant phenotype, i.e., scarring and variegation for those endosperm markers that are present in the heterozygous condition. However, when sib plants are grown in the greenhouse in the winter, the kernels produced are completely normal in phenotype. If these normal appearing kernels are planted in the field the following summer, the extreme mutant phenotype is again expressed. Plants homozygous for st^e were grown in a light chamber that simulated the long day conditions of the field (16 hr. day) and the low temperature of the greenhouse (70°F), to distinguish between an effect of temperature and length of day. The kernels produced were completely normal. A sib plant was grown in the light chamber under the same conditions except that, after pollination, a heating pad was wrapped around the ear shoot, which raised the daytime temperature in that region of the plant to approximately 90°F. The progeny kernels of this plant showed the mutant phenotype. These experiments indicate that this allele is temperature sensitive with the mutant phenotype expressed only at the high temperatures.

2. A new mutable allele at the c locus.

In recent years (M.N.L. 30) we have studied a spontaneously occurring mutational system at the c locus. This highly mutable recessive gene, c^m, mutates to both C and to a stable c. The mutations occur at many stages in the development of the plant, in the sporophyte and gametophyte, as well as in the endosperm. The size of the mutated areas varies from only a few cells on a kernel to large sectors on the ear, which include a large number of kernels. Mutations to c are about four times as frequent as those to C. The germinal changes to both C and c are completely stable in subsequent crosses. The mutations are not associated with chromosomal aberrations. No aberrations are found in the progeny of mutated kernels and there is an absence of variegation within the mutated areas on the kernels for either C itself or any other markers more proximally placed on the short arm of chromosome 9. Linkage relationships indicate that the mutability of c^m is autonomously controlled. It is completely independent of the Ac-Ds system.

The c^m gene is stable in the zygote. This condition persists until some time during ontogeny when the gene becomes unstable and free to mutate. At fertilization, those genes in the zygotes that had not as yet mutated to either C or to the stable c revert to the stable condition and the cycle is repeated. However, the unstable condition persists in the endosperm resulting in frequent somatic mutations.

Three states of the c^m gene are found regarding the stage in ontogeny at which time the gene becomes unstable.