

shows dominance over *st*. When *st*<sup>e</sup>/*st*<sup>e</sup> 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*<sup>e</sup> 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*<sup>m</sup>, 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*<sup>m</sup> is autonomously controlled. It is completely independent of the Ac-Ds system.

The *c*<sup>m</sup> 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*<sup>m</sup> gene are found regarding the stage in ontogeny at which time the gene becomes unstable.

- A. A late state where mutations occur only after fertilization.
- B. An intermediate state where the  $c^m$  gene becomes unstable some time around meiosis. Up to about 10% of the kernels in the colored class are self-colored, occurring singly on the ears.
- C. An early state where this gene becomes unstable in the young sporophyte. While the majority of the colored kernels on such ears are self-colored, arising in sectors, both singly occurring self-colored kernels and variegated kernels are found indicating late mutations of genes that had not mutated earlier.

Of the three, the late mutating stage is the most stable showing only infrequent shifts to one of the other states.

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1. Segregation absence.

An aberrant of C 103 with darker leaf color and without the typical faint longitudinal striping common in sections of this state with this inbred is now known as Pa C 103 g (g for green). In 1956, in an extremely small population, a few plants had the upper leaves failing to unroll from around the tassel. The single-cross C 103 x Pa C 103g in 1956 and 1957 exhibited a small amount of vigor, but this vigor in no way approached expected, probably eliminating the possibility of an outcross.

The single-cross, F<sub>2</sub>, and BC<sub>1</sub> generations in both directions (with reciprocals) were hand planted in unthinned observation populations of from 400 to 600 individuals at Hershey (Pa.) in 1957 along with the two lines. Observations were periodic until after silking in this dry year.

Pedigree

Leaf Observations

C 103

100% light green color, slight longitudinal striping

Pa C 103g

100% dark green color, striping absent

C 103 x Pa C 103g

100% similar to Pa C 103g

Pa C 103g x C 103

100% similar to Pa C 103g