noted when the relative magnitude of the means of the various generations did not agree with the relative magnitude expected under the assumption of no epistasis.

The three genetic models involving five loci found to be compatible with the F_2 data collected at the three year-locations showed a consistent pattern of gene action, although the relative value of the genotypes varied, reflecting a genotype X environment interaction. Assuming these three models were correct, predictions were made concerning the disease reaction of single crosses relative to the disease reaction of their respective parental lines. This indicates that single crosses which are more resistant than either parent, and single crosses which are more susceptible than either parent are to be expected. Furthermore, a single cross more resistant than either parent and a single cross more susceptible than either parent may have one parental inbred in common.

Data obtained on various inbred lines and their single crosses in 1956 are in agreement with the expectations based on the five factor genetic models.

From the point of view of the plant breeder, these results indicate that the brown spot reaction of an inbred line is not a reliable indication of the reaction of single crosses involving that inbred, and the hybrid combinations themselves must be tested for brown spot resistance.

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1. Studies on a mutable system involving chromosome 6.

A yellow mosaic kernel was found on an ear of a *yy* x *YY* cross. The resulting plant was selfed and yellow mosaic and white endosperms segregated. The yellow mosaic endosperms are characterized by a white background with yellow spots if the yellow area is small. The large yellow areas may be somewhat irregular in outline. Progeny from the selfed plant were grown and a recessive pale green character segregated. Some of the pale green plants possessed numerous mutant green areas on the pale green (or white) background. These plants in addition to being pale green also have a white sheath and somewhat banded white areas on the leaves. Classification of the pale green character in the seedling stage is good in the field but poor in the greenhouse. However, classification of the character in the mature plant is excellent both in the field and in the greenhouse. The mutable white allele has been designated as y^m and the mutable pale green allele as pg^m.

In crossover tests, $\underline{Y}\ \underline{Pg}/\underline{y}^m\ \underline{pg}^m$ x $\underline{y}^m\ \underline{pg}^m$, there was no crossing over between $\underline{y}^m$ and $\underline{pg}^m$ in tests involving 7944 plants. In some of these tests the female plants carried (either one or two) controlling elements and others had none. Two point tests gave approx. 35% crossing over between $\underline{y}$ and $\underline{su}_2$; crossing over between $\underline{y}^m$ and $\underline{su}_2$ was approx. 20%. Cytological studies provided no evidence for a chromosomal aberration. It seems possible that a rather large region on chromosome 6 may be involved. Spreading effect could be involved.

In preliminary tests the controlling elements failed to induce $\underline{Ds}$ action. Also, $\underline{Ac}$ did not induce $\underline{y}^m$ to mutate.

With respect to controlling elements, certain tests indicate the presence of two independent dominant controlling elements. One such test is presented below:

$\frac{Y\ Pg}{y^m\ pg^m}$ heterozygous for controlling elements x $y^m\ pg^m$ no controlling elements

Endosperm Classification

Yellow	Yellow mosaic	White
190	130	35

Plant Classification

	green	pale green	pale green mosaic	pale green
	171	34	77	24
Possible ratio	4	1	2	1

This and similar tests suggest that there are two dominant controlling elements one of which induces both $\underline{y}^m$ and $\underline{pg}^m$ to mutate and the other only induces $\underline{y}^m$ to mutate.

The controlling elements have been tentatively designated as $\underline{Ce}_1$ (controlling element) which induces both $\underline{y}^m$ and $\underline{pg}^m$ to mutate and $\underline{Ce}_2$ which induces $\underline{y}^m$ to mutate.

The time of mutation and mutation rates (number of mosaic areas per endosperm) vary for different plants. Dosage of controlling elements and perhaps dosage of the $\underline{y}^m\ \underline{pg}^m$ region as well affect mutation rates and ratios of yellow mosaic endosperms. Some tests indicate that the controlling elements do not affect the expression of normal $\underline{Y}$. Tests relating to the above problems are in progress.

With respect to sectoring, no ear sectors of yellow mosaic endosperms have been found. However, ear sectors of germinal mutations (yellow endosperms) have occurred. In all cases except one, the plant grown from yellow endosperm germinal mutations (from ear sectors) have been green. In other words, y^m and pg^m mutated simultaneously to the dominant.

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1. Placement of seedling chlorophyll mutants.

Seventeen radiation-induced seedling chlorophyll mutants have been placed in appropriate linkage groups by utilizing endosperm-marked translocations as testers. Crosses between the mutants and an array of translocations were made at Cal Tech and the F_1 and F_2 populations were grown at Penn State.

The series of translocations used involved breaks near Y_1 on chromosome 6, su on 4, or wx on 9; with breaks in different arms of all other chromosomes except 7. If clear-cut data indicated no linkage with any testers, the mutant was assumed to be on chromosome 7.

For each of the mutants the phenotype and number, the linkage group, and the translocation(s) with which each showed linkage are listed in the following table. Allelism tests have not been run on the two virescents and the two yellows which were placed in identical linkage groups.

Mutant Phenotype	Mutant Number	Linkage Group	Translocations which identified linkage group
(Pale green	8616	7	elimination)
Virescent	4873	3	3-9c
Virescent	5575	3	3-9c
Virescent	8623	4	4-9b
Virescent	8647	7	elimination (also linked to gl_1)
Virescent	8661	8	8-9d
White	8336	3	3-9c
White	8613	1	1-6c and 1-4d
White	8630	8	8-9a
White	8889	9	1-9c; 2-9b; 4-9b; 8-9d; 9-10b
White	9005	4	4-8a; 1-4a; 4-9(F-22)