7. Use of atrazine.

A commonly-employed weed killer and suppressor, atrazine has been shown to remain detectable in the soil for periods measured in years. A comparison of 15 races, stocks and hybrids grown on treated versus untreated halves of the same rows was made. To test responses of the plants under these conditions, a part of every section of each row was treated with GA. Response to GA was not influenced by atrazine. Other features with atrazine: dwarf-1, reduced in height and tillering; corn-grass, intensified in expression; zapalote chico, average height increase of 6 inches; spancross, size and vigor increased; pioneer 349 and its immediate parents, greater seedling vigor; others made no noticeable responses.

8. Tests involving other growth-regulating substances.

A number of other compounds not previously tested in 500-microgram doses were applied to races, hybrids and inbreds as well as to genetic stocks including ra_1, ra_3, tsb, na_1 and na_2. These were based on comparisons of 10-plant samples and a 10-plant control. The most significant outcome of the study is that these chemicals, applied at the rather high dosage, did not seriously alter plant growth, anthesis, and ear formation. The numbers below refer to numbers of stocks tested.

Alpha-phenyl butyric acid--more growth in 7, 6 equal to controls.
Gamma-phenyl butyric acid--6 equal to, 3 larger, 4 less than controls.
Indole propionic acid--5 shorter, 2 equal to controls.
Maleic Hydrazide (100 ppm)—reduces color in 5, shorter in 4, taller with more color in 4.
2,4-D (100 ppm)--3 reduced in growth, 3 enhanced, 2 equal to controls.
Indole--heavier vegetative growth in 2, slower growth and shorter in 2.
Iso-butyric acid--1 shorter, 5 with more vegetative growth, 1 slowed in reproduction.
Normal butyric acid--5 retarded, 1 equal to controls.

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1. A second case of hybrid enzyme formation in heterozygotes.

The pH 7.5 esterases specified by the E_1 gene exist in the form of a dimer. In homozygotes the dimers are composed of two identical monomers (autodimers), while in heterozygotes three enzyme types are found: the two autodimers produced when the alleles are in homozygous condition and in addition a hybrid enzyme (allodimer), composed of two homologous but non-identical monomers. As expected, the migration rate of the allodimer is always intermediate between the two autodimers. In starch gel electrophoresis the SS autodimer, formed by the E^S allele, bands out at a characteristic slow moving position. However, even plants which lack the E^S allele show a weak esterase band at the SS position (constant S).

This esterase must be specified by another non-allelic gene since this gene does not segregate from the $\underline{E}_1$ alleles. For example, $\underline{E}_1^F/\underline{E}_1^F$ plants show two bands at the pH 7.5 esterase positions; an intense FF band and a weak band at the SS position. If such a plant is self-pollinated all of the progeny give identical zymograms and show both esterase bands. Further proof for the non-allelism comes from the observation that no hybrids are formed between the pH 7.5 esterases and the constant S. This point also argues against the possibility of duplicate genes since if the product of the two genes were the same, allodimers should be formed.

The gene controlling the synthesis of the "constant S" enzyme has been designated $\underline{E}_3$. We have recently picked up a mutant of this gene, $\underline{E}_3^S$, which produces an enzyme with an altered electrophoretic migration rate. Homozygotes for either allele form only a single $\underline{E}_3$ esterase band. However, as is the case with the pH 7.5 esterases, three bands are found in the heterozygotes. The hybrid band shows an intermediate migration rate and in diploid tissue its intensity is greater than that of the other two bands.

The $\underline{E}_1$ and $\underline{E}_3$ genes are not linked and segregate independently. Since the genotypes can be accurately determined by scoring the zymograms of seedling extracts it is possible to score all nine genotypes segregating in the F_2 progeny of the cross $\underline{E}_1^N/\underline{E}_1^N$, $\underline{E}_3^S/\underline{E}_3^S$ X $\underline{E}_1^F/\underline{E}_1^F$, $\underline{E}_3^F/\underline{E}_3^F$. The observed distribution closely fits the expected 1:2:1:2:4:2:1:2:1 distribution.

E_1^N/E_1^N, E_3^S/E_3^S - 46

E_1^N/E_1^N, E_3^S/E_3^F - 84

E_1^N/E_1^N, E_3^F/E_3^F - 47

E_1^N/E_1^F, E_3^S/E_3^S - 87

E_1^N/E_1^F, E_3^S/E_3^F - 186

E_1^N/E_1^F, E_3^F/E_3^F - 87

E_1^F/E_1^F, E_3^S/E_3^S - 49

E_1^F/E_1^F, E_3^S/E_3^F - 114

E_1^F/E_1^F, E_3^F/E_3^F - 50

Hybrid enzyme formation may be quite common in maize. Two cases have now been described where mutant alleles form enzyme types with altered charge, and in both cases ($\underline{E}_1$ and $\underline{E}_3$) hybrid enzymes are formed in heterozygotes.

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