Table 1

Three year summary of black spot maturity (BSM) and filling period variation among 20 maize inbreds.

	High inbred	Low inbred	Average of twenty inbreds
GDD from planting to BSM	1808	1337	1648
% moisture at BSM	35.0	15.4	25.2
Dry wt. at BSM (mg/k)	322	192	237
GDD from planting to pollination	1060	818	940
GDD in the filling period	821	512	708
Rate of dry wt. accumulation (mg/k/day)	9.7	6.2	7.7

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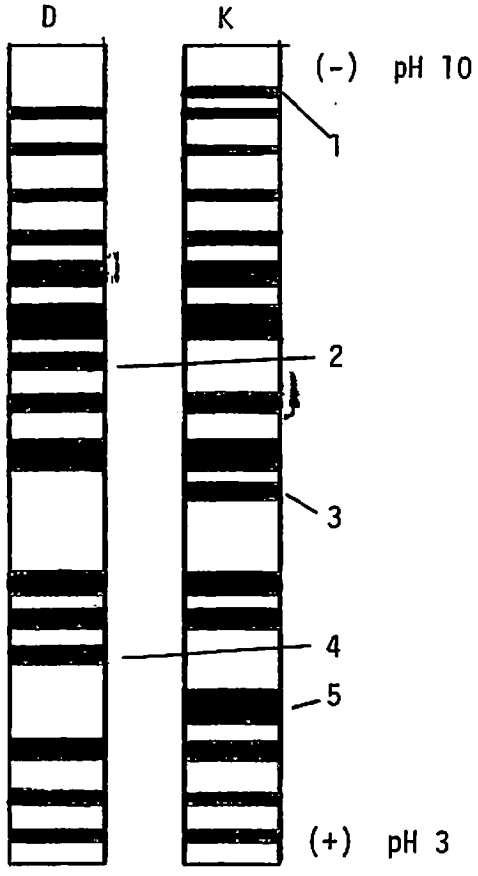
1. Electrophoretic separation of peroxidases of lines carrying two different male-sterile cytoplasms.

The two male-sterile cytoplasms, D and K, both arose in Turkey (Beckett, 1971) and respond alike to restoration alleles (Beckett, 1971). Moreover, maize lines carrying either of the two cytoplasms are resistant to attack by the fungus Helminthosporium maydis (Gracen, et al., 1971). Hence, by three phenotypic criteria, i.e., male-sterility, response to restoration alleles, and fungal resistance, the D and K mutant cytoplasms appear to be identical. However, the three phenotypic manifestations

Figure 1

Polyacrylamide Gels Stained For Peroxidase Activity Following Isoelectricfocusing of Cellular Proteins of Plants With D or K Male-Sterile Cytoplasm



mentioned above are gross expressions of an unknown number of interacting biochemical pathways and may not reveal differences between the two cytoplasms at the protein level.

I have subjected the cellular proteins of fourteen to sixteen day old corn seedlings, carrying D or K cytoplasm, to isoelectric focusing on polyacrylamide gels and stained the gels for peroxidase, esterase and acid phosphatase activities. Only the gels stained for peroxidase activity show any differences between the two cytoplasms. As shown in figure 1, the gel from K proteins has bands of peroxidase activity at points 1, 3, and 5 that are lacking on the D gel. At points 2 and 4 the K gel lacks a band that is present on the D gel.

The possible explanations of the multiple band differences are many. The easiest, and perhaps most naive, explanation is one of differential synthesis of protein species in the cells of the two cytoplasm-sterile lines. That is, the synthesis of the species of peroxidase at points 1, 3, and 5 is repressed in cells carrying D cytoplasm while the species of peroxidase at points 2 and 4 is repressed in cells carrying K cytoplasm. However, other explanations, e.g., aggregation of molecules and repressed activity, are possible and cannot be ruled out at this time.

A major question is one of isogenicity of the two lines. The nuclear background in both lines is C0192, the original lines having been backcrossed to C0192 as the recurrent parent for six generations. While it is possible that the five differential peroxidase bands actually represent five segregating genes, it seems unlikely in that esterase patterns (13 bands) and acid phosphatase patterns (4 bands) of the D and K gels are identical.

It is also impossible to correlate the five peroxidases with either a plasmagene or nuclear gene code. It would appear that the data are demonstrating different cytoplasmic-nuclear interactions in the peroxidase activities of several proteins.

References:

Beckett, J. B. 1971. Classification of Male-Sterile Cytoplasms in Maize (Zea mays L.). Crop Sci. 11: 724-727.

Gracen, V. E., M. J. Forster, and C. O. Grogan. 1971. Reactions of Corn (Zea mays) Genotypes and Cytoplasms to Helminthosporium maydis Toxin. Pl. Dis. Rptr. 55: 938-941.

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