AaBb consists of ¼ having both bands 2 and 4, ¼ having only band 2, ¼ having only band 4 and ¼ having neither band. Theoretically, this results in 9 phenotypes (2^S4^S, 2^W4^W, 2^S4^W, 2^W4^S, 2^S, 2^W, 4^S, 4^W and a null type). Of these 9 phenotypes, only 6 would be apparent in the gel (since it is most difficult to differentiate between 2^S4^S and 2^W4^W, between 2^S and 2^W, and between 4^S and 4^W, owing to the effect of minor differences in concentration of extracts applied to the gel).

Table 3

Expected F_2 ratios and phenotypes for esterase bands 2 and 4. (A, band 2; B, band 4; a and b, null alleles)

F_2 genotype	per cent of pollen producing bands: (2 & 4)	(2)	(4)	null	F_2 phenotype
AABB	100	0	0	0	2^S4^S*
AABb	50	50	0	0	2^S4^W
AaBB	50	0	50	0	2^W4^S
AaBb	25	25	25	25	2^W4^W
AAbB	50	50	0	0	2^S4^W
AAbb	0	100	0	0	2^S -
AabB	25	25	25	25	2^W4^W
Aabb	0	50	0	50	2^W -
aABB	50	0	50	0	2^W4^S
aABb	25	25	25	25	2^W4^W
aaBB	0	0	100	0	- 4^S
aaBb	0	0	50	50	- 4^W
aAbB	25	25	25	25	2^W4^W
aAbb	0	50	0	50	2^W -
aabB	0	0	50	50	- 4^W
aabb	0	0	0	100	- -

* s, strong; w, weak

At the present time there appears to be no immediate method to distinguish whether pollen esterase isozymes 2 and 4 are synthesized under gametophytic or sporophytic control.

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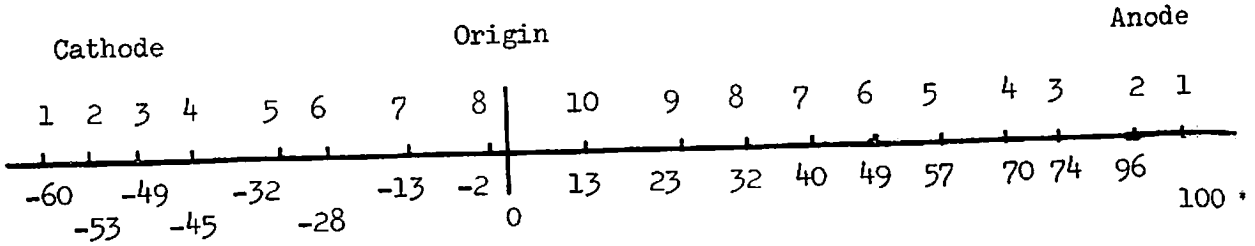
3. Peroxidase isozymes in maize.

Electrophoretic separation of maize extracts on starch gel reveals several distinct zones or bands with peroxidatic activity. Different strains of maize are being used in genetic studies of these peroxidase polymorphisms. Maize tissues studied intensively have been the seedling root and shoot, and 14-day old endosperm. Seedlings are germinated in petri dishes, and saline extracts used for electrophoresis. Starch gels are stained with o-dianisidine, a stain superior to benzidine for permanent gels.

Roots provide the clearest isozyme patterns, while endosperm produces weakly staining bands. Cathode-migrating bands stain more distinctly than anode-migrating isozymes. A total of at least 18 bands have been distinguished in different gels, 10 moving to the anode (A1 to A10) and 8 to the cathode (C1 to C8; see diagram).



*Approximate Rf values in terms of the fastest anode wandering band.

Table 1 presents the distribution of the 18 peroxidase isozymes. Bands A1 and A2 (Table 1) have been observed only in roots; they stain best with benzidine and have not been observed separately in about 20 inbreds. Both were absent in Connecticut inbred C53, but present in hybrids involving this inbred. Bands A3 and A4 were also present in roots but absent in shoots and endosperm, and showed genetic polymorphism. Although both bands stain intensely, they often appear blurred on starch gels. A5, A6, and A7 have been observed only in shoots; no genetic polymorphisms have been observed. A8 is a strong clear band in all 3 tissues studied, and shows no polymorphism, making it useful as a reference band. Isozymes A9 and A10 are strong bands near the origin which are often blurred. They are best seen in roots and are absent from endosperm. Diffuse staining near the origin is common on gels from shoot and root tissues.

In general, the bands moving to the cathode are clearer and more sharply defined than those going to the anode. C1 and C2 were found in roots and endosperm, absent from young shoots, but present in leaves from mature plants. Genetic polymorphisms were common for both bands among inbreds and within tropical races of maize. C3 is very distinct and useful as a reference band. C4 appears always to be present in roots, shoots and endosperm, although it is very weak. C5 and C6 are clear bands, difficult to separate; while C7 and C8, like A9 and A10, are close to the origin and often blurred.

D. Elizabeth Hamill