

Isoenzymes of Victoria Blight-Resistant Oat Lines Selected from Susceptible Cultivars

Harry Wheeler, Anton Novacky, and H. H. Luke

Professor and Research Associate, Department of Plant Pathology, University of Kentucky, Lexington 40506; and Plant Pathologist, Crops Research Division, ARS, USDA, Department of Plant Pathology, University of Florida, Gainesville 32603, respectively. Present address of second author: Department of Plant Pathology, University of Missouri, Columbia 65201.

Kentucky Agricultural Experiment Station Journal Series Paper No. 71-11-44. Supported in part by U.S. Public Health Service Grant No. ES-00319.

ABSTRACT

Isoenzyme patterns of three Victoria blight-resistant oat lines selected from susceptible cultivars were indistinguishable from those of their putative parents. Disc gel electrophoresis appears useful, both as a preliminary test and as a supplement to other methods, for the determination of genetic origin in large-scale screening or breeding programs. *Phytopathology* 61:1147-1148.

In a mass screening program, ca. 50 million oat seedlings of Victorgrain 48-93 and Fulgrain, both susceptible to Victoria blight, were treated with victorin, the pathotoxic product of *Helminthosporium victoriae* Meehan & Murphy (3). A total of 973 seedlings resistant to both victorin and *H. victoriae* was recovered.

Of these, 471 were highly susceptible to rust and were discarded after the first year. Most of the remainder, which were studied over a period of 3 years, differed in agronomic type from their putative parents, and were assumed to be out-crosses or contaminants. A total of 72 selections appeared to be identical, except for disease reaction, to one of the parental types, and these were assumed to represent mutations (1). Because of limited facilities, only three lines assumed to be mutants have been maintained for experimental purposes. One (BRM 284) was derived from Victorgrain 48-93, and the other two (BRM 280, BRM 281) from Fulgrain.

Experience with this project pointed up the need for a rapid, nondestructive method for separating mutants from out-crosses or mechanical mixtures in large-scale screening or breeding programs. Isoenzyme patterns obtained by gel electrophoresis may, at least in part, meet this need.

Disc gel electrophoresis of leaf proteins was carried out by methods previously described (2). In addition to total soluble proteins, the following enzymes were examined: acid phosphatase, malic dehydrogenase, polyphenol oxidase, and peroxidase. In all cases, electrophoretic patterns of the three experimental lines were indistinguishable from those of their putative parents. Isoperoxidase patterns were particularly distinctive (Fig. 1). The patterns obtained with BRM 284 and its putative parent, Victorgrain, were virtually identical, and the same was true of patterns from BRM 280, BRM 281, and Fulgrain. Victorgrain and Fulgrain had many bands in common. This might be expected, since

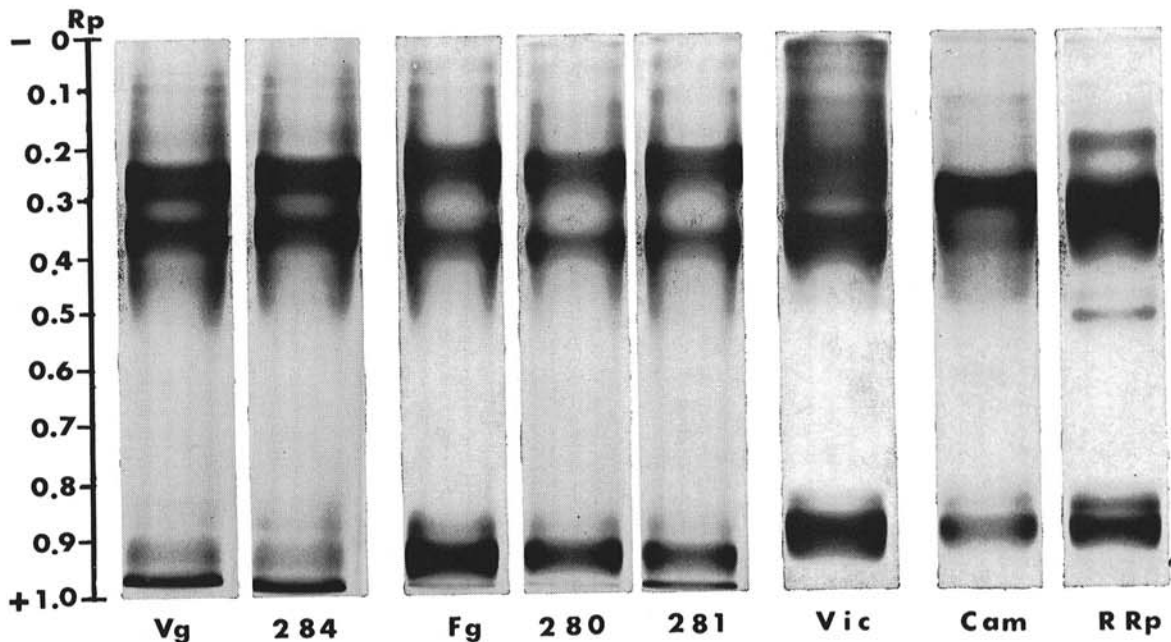


Fig. 1. Isoperoxidases of Victoria blight-resistant oat lines selected from susceptible cultivars. Symbols: Vg = Victorgrain 48-93; Fg = Fulgrain; and Vic = Victoria; all susceptible to Victoria blight. RRp = Red Rustproof; Cam = Camellia; both resistant to Victoria blight. BRM 284 = resistant line selected from Victorgrain 48-93; BRM 280 and BRM 281 = resistant lines selected from Fulgrain. Rp values indicate relative positions of bands.

they were sister selections from the same cross. The two can be distinguished, however, by differences in activity of a band at Rp 0.95 and in the position of bands between Rp 0.2 and 0.4. The patterns obtained from other cultivars included for comparison are all clearly different from Victorgrain and Fulgrain, and from each other (Fig. 1).

The isoenzyme patterns found support the conclusion, based on agronomic characters, that the experimental lines studied represent mutants rather than out-crosses or contaminants. Electrophoretic patterns can be obtained rapidly and with small amounts of tissue; one leaf can be used if necessary. Therefore, large numbers of single plant selections can be tested

without sacrificing the plants. Disc gel electrophoresis appears useful, both as a preliminary test and as a supplement to other methods, for the determination of genetic origin.

LITERATURE CITED

1. LUKE, H. H., H. E. WHEELER, & A. T. WALLACE. 1960. Victoria-type resistance to crown rust separated from susceptibility to *Helminthosporium* blight in oats. *Phytopathology* 50:205-209.
2. NOVACKY, A., & H. WHEELER. 1970. Victorin-induced changes of peroxidase isoenzymes in oats. *Phytopathology* 60:467-471.
3. WHEELER, H., & H. H. LUKE. 1955. Mass screening for disease-resistant mutants in oats. *Science* 122:1229.