Preinoculation peroxidase activity in cucumber leaves not associated with race 2 anthracnose resistance

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Anthracnose, caused by the fungus *Colletotrichum lagenarium* (Pass.) Ell. and Halst., is one of the major foliar diseases of cucumbers. An inexpensive screening aid for anthracnose resistance would be useful to plant breeders, since it would permit testing in the seedling stage instead of running field tests. Biochemical assays are potential screening aids.

Preinoculation levels of peroxidase activity in cucumber leaves were investigated for their possible association with race 2 anthracnose (2) resistance. Peroxidase activity has been implicated in disease resistance in plants (1). Three experiments were conducted.

Methods. In experiment 1, the resistant line 'ARF79-95', the susceptible cultivar 'Model', the reciprocal F1 progeny, and the F2 population were grown in the field in a completely random design replicated in 4 locations. The youngest fully-expanded leaf was harvested at the 10-leaf stage. The plants were then inoculated with anthracnose race 2 (10,000 spores/ml) and rated for disease reaction for 5 weeks. The soluble, ionically-bound, and covalently-bound peroxidases were extracted from the leaf samples (5) and their activities determined with the guaiacol assay (4).

In experiment 2, soluble peroxidase activity of 7 different genotypes as well as individuals from reciprocal F2 populations of a cross between 'AR 79-95' and 'Model' were determined using the o-tolidene assay (3). Leaf samples were taken from plants in the 2-leaf stage.

In experiment 3, the isozymes of the soluble peroxidases extracted from the leaves in experiment 2 were separated using flatbed isoelectric focusing. A constant level of peroxidase activity was applied in each lane.

Results. All 3 peroxidase fractions gave similar results for least squares means (Table 1) and the analysis of variance (Table 2) for soluble peroxidase activity of parents and progeny. Preinoculation levels of peroxidase activity varied with location and with location by genotype interaction.

Variations in genotype were primarily maternal. In the F2, there was no consistent relationship between peroxidase activity and disease rating from location to location. Likewise, the use of the substrate o-tolidene in experiments 2 and 3 did not reveal any relationship between soluble peroxidase activity or activity of individual isozymes and disease ratings of parents or progeny.

In conclusion, preinoculation levels of peroxidase activity, as assayed with 2 nonspecific substrates, showed no relationship to race 2 anthracnose resistance and were not useful as a screening aid.

Table 1. Least squares means of locations and genotypes for soluble peroxidase activity (AU/g fresh weight leaf)[z].

Location number	Least squares mean	Genotype	Least squares mean
1	59.8 a	Model	58.1 a
2	58.2 a	Model x AR79-95	56.1 a
3	38.4 b	AR79-95 x Model	49.6 b
4	57.3 a	AR79-95	49.9 b

[z]Means within each column separated by LSD at 5%.

Table 2. Analysis of variance of soluble peroxidase activity (AU/g fresh weight leaf) for the parents and reciprocal F1 progeny of the cross 'Model' x 'AR79-95'.

Source of variation	df	Sums of squares	F ratio
Location (L)	3	2330	21.8**
Genotype (G)	3	417	3.9*
L x G	9	3700	11.5**
Error	15	534	
Total	30	6982	
CV (%)	11		

*,**Indicates significance at the 5 and 1% levels, respectively.

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