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VARIATION OF PATHOGENICITY TO CORN SEEDLINGS OF ISOLATES OF *HELMINTHOSPORIUM MAYDIS*

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ABSTRACT

Four single spore isolates of *H. maydis* Race T were used to study pathogenic variability in greenhouse studies. Seedlings of Ky21 inbred corn produced with normal (N) and six different cytoplasms (T, C, G, M, W, K) conditioning male sterility were inoculated with spore suspensions by atomization. Pathogenicity of the isolates was determined by measuring size of lesions with a planimeter. Variation in pathogenicity of the isolates indicates the existence of biotypes within Race T.

INTRODUCTION

Mercado and Lantican (1961) first noted increased susceptibility of cytoplasmic male-sterile corn to *H. maydis*, the pathogen causing southern corn leaf blight. Villareal and Lantican (1965) and Scheifele, et al. (1970) made similar observations. Following the 1970 southern corn leaf blight epidemic, Hooker, et al. (1970b) differentiated Race O and Race T of *H. maydis*. Resistance to Race T has been reported in corn lines with normal (N) cytoplasm and in several produced with male-sterile cytoplasms (Hooker, 1970a; Smith, 1971; Bergquist, 1972).

Studies of pathogenic variability have been made with *H. victoriae, H. carbonum*, and *H. sativum* on corn and oats (Nelson and Herbert, 1960; Nelson and Ullstrup, 1961; Wood, 1959). Prior to the 1970 epidemic, Yu (1933) and Orillo (1952) reported varying degrees of pathogenicity of *H. maydis* on corn.

The objective of this study was to determine the pathogenic variation among isolates of *H. maydis* Race T to corn seedlings with six male-sterile and normal cytoplasms.

MATERIALS AND METHODS

Four single spore isolates of *H. maydis* Race T isolated from lesions in the field were used to study pathogenic variability in a greenhouse test. Test plants were seedlings of corn inbred Ky21 produced with N and male-sterile cytoplasms T, C, G, M, W, and K. Sporulating fungal cultures on potato dextrose agar (PDA) were flooded with a 5% sucrose, 0.2% Tween 20 solution and the spores were suspended by scraping the surface of the plate. A hemacytometer was used to make spore counts, and spore suspensions for each isolate were adjusted with sterile water to 20,000 spores/ml.

Six seedlings of each cytoplasm type in 2-4" pots were inoculated in the 3-4 leaf stage. All combinations of cytoplasm and fungus isolate were made. Inoculum was applied to leaf surfaces with an atomizer. The plants were then placed in a darkened mist chamber for 24 hours, then removed from the mist to a greenhouse bench. After 72 hours the second and third leaves of each were removed by clipping with a razor blade at the sheath. The leaves were placed in a plant press and dried for two weeks. At this time, the leaves were photographed and the photographs enlarged to 5 x 7 inches. A total area for each dried leaf was determined using an area meter; the diseased area was determined by planimetry of the photographs, and percentage of diseased area computed for each leaf. A Duncan's analysis was performed to determine significance among the isolates within each cytoplasm (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

The high percentage of diseased leaf area on seedlings with T cytoplasm, as shown in Table 1, indicates that all isolates were Race T. There were no significant differences in pathogenicity among isolates for C, W, and T cytoplasms. There was significant variation in pathogenicity of isolates on other cytoplasms. Isolates 3 and 4 were the most pathogenic on N cytoplasm with

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3.5 and 2.5 percent of the leaf area diseased, respectively, and isolate R4 was the least pathogenic. Isolates 3, 4, and 1 were not significantly different on G cytoplasm; isolate 2 was significantly less pathogenic than the others on plants with G cytoplasm. Isolate 4 was the most pathogenic and 1 was the least pathogenic on M cytoplasm. On plants with K cytoplasm, isolate 1 was significantly more pathogenic than other isolates. Isolates 2, 3, and 4 were not different on K. These results indicate that within *H. maydis* Race T there are biotypes that are more virulent to particular male-sterile cytoplasms than to others.

The susceptibiltiy of male-sterile cytoplasms C and W reported here may have been due, in part, to effects other than the male sterile cytoplasm. There may have been genotypic differences among the seedlings due to the lack of complete homozygosity in the inbred used. In addition, Bergquist and Peverly (1972) have suggested that variation in the degree of resistance and susceptibility to *H. maydis* is conditioned by the interaction of nuclear and cytoplasmic factors. However, Smith et al. (1971) reported cytoplasms C and W resistant to *H. maydis* Race T in greenhouse studies using Ky21. The discrepancy between the cytoplasm reaction reported here for cytoplasm C and cytoplasm W and that of previous works may have been due to the high concentrations of spores used in the greenhouse inoculations. The 20,000 spore/ml concentration used in this study is large in comparison to those of other similar studies (Bergquist, 1972; Hooker, 1970a).

TABLE 1. *Pathogenicity of 4 isolates of* Helminthosporium maydis *Race T on Ky21 corn seedlings with normal and 6 male-sterile cytoplasms.*

	Percentage diseased leaf area/cytoplasm type						
Isolate	T	N	C	G	M	W	K
1	49.75a[1]	0.75 c	46.50a	6.00a	1.00 b	19.75a	22.25a
2	49.75a	1.25 bc	48.25a	2.75 b	2.25ab	28.25a	1.75 b
3	48.00a	3.50a	6.75a	5.25a	2.50ab	47.50a	1.50 b
4	39.25a	2.50ab	15.00a	7.75a	4.75a	22.25a	5.00ab

[1]The small letters indicate Duncan's multiple range groupings. Treatments followed by the same letter do not differ significantly at the 5% level.

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