Pathotypes of *Peronosclerospora sorghi*

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ABSTRACT

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Two pathotypes of *Peronosclerospora sorghi* were identified by differential pathogenicity on seedlings of sorghum lines inoculated with conidia. Differences in pathogenicity were expressed as percentage of inoculated plants that contracted sorghum downy mildew. Pathotype 2 caused higher percentages of mildew in differential sorghum cultivars than did pathotype 1.

Vertical pathotypes, as defined by Robinson (6), are populations of a pathotype that can be differentiated by their interactions with vertically resistant cultivars of a single host species. To our knowledge, such pathotypes have not been demonstrated experimentally in *Peronosclerospora sorghi* (Weston & Uppal) C. G. Shaw, the causal agent of sorghum downy mildew.

Pathogenicity differs among populations of *P. sorghi* from different geographic areas (3). The form of *P. sorghi* found in Rajasthan, India, is pathogenic to maize (*Zea mays* L.) and tanglehead (*Heteropogon contortus* (L.) Beauv.) but not to sorghum (*Sorghum bicolor* (L.) Moench) (2,3). In contrast, *P. sorghi* in Karnataka, India, attacks maize and sorghum but not *H. contortus* (3,7). Payak (5) postulated that two races of the pathogen, differentiated by pathogenicity to sorghum and maize, occurred in India. A comparison of isolates of *P. sorghi* from Thailand and Texas demonstrated that the Thai form of *P. sorghi* differed from the Texas strain in its inability to infect sorghum and its greater virulence to maize differentials (8). In the classification system proposed by Robinson (6), populations of a pathogen that differ in host range at the species level or above should be classed as *Formae specialis* rather than pathotypes.

In 1979, a high incidence of sorghum downy mildew was noted in a reputedly resistant grain sorghum hybrid grown in San Patricio County, Texas. The hybrid had shown high levels of resistance for several years in areas where sorghum downy mildew is endemic. The study reported here was conducted to determine if the increased susceptibility exhibited by the sorghum hybrid was caused by a new pathotype of *P. sorghi.*

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MATERIALS AND METHODS

Two populations of *P. sorghi* were compared for pathogenicity. One population was obtained from infected sorghum plants collected in Texas before 1978. The second population originated from infected plants of a supposedly resistant sorghum cultivar grown in San Patricio County, Texas, in 1979. These populations shall be referred to as standard (S) and new (N), respectively.

The two collections of *P. sorghi* were maintained in the greenhouse on sorghum plants infected by conidial inoculation (4) of freshly germinated seeds. The two populations were tested for pathogenicity to the sorghum hybrid from which N originated, five other sorghum cultivars, three maize lines, *H. contortus,* and *Zea mexicana* K. Twenty or more plants of each test cultivar were inoculated (1) with conidia of S and N at the first to second leaf stage of growth. The inoculated plants were grown in the greenhouse and observed for symptoms of systemic sorghum downy mildew (1) for 21 days after inoculation. The sorghum entries were retested in a second trial.

RESULTS AND DISCUSSION

The sorghum hybrid from which N was isolated and the sorghum inbred CS3541 gave differential reactions to the two populations of *P. sorghi* (Table 1). Both were much more susceptible to N than to S. Among the other sorghum inbreds, QL-3 and Tx430 were resistant to both collections of *P. sorghi*; Tx2748 and Tx7078 were susceptible to both. The maize inbred B68 was very susceptible to both forms of the pathogen, and 33-16 and R177 were very resistant. Both S and N infected teosinte, but neither was capable of inducing sorghum downy mildew in *H. contortus*.

Our results demonstrate that the two populations of *P. sorghi* represent different pathotypes as defined by Robinson (6). The S and N populations were identical in host range at the species level and differed in their interactions with cultivars of *S. bicolor*. The sorghum inbred CS3541 appears to be the best of the possible differentials for use in standardized tests. The sorghum hybrid from which N was isolated is the product of a commercial seed company, and its pedigree is not public knowledge.

Table 1. Reactions of sorghum, maize, teosinte, and tanglehead cultivars to two pathotypes of *Peronosclerospora sorghi*

Species Cultivar	% Infection[a] Trial 1 S[b]	N[c]	Trial 2 S	N
Sorghum bicolor				
Hybrid	12	44	24	79
CS3541	4	52	0	74
QL-3	0	0	1	1
Tx430	0	0	0	0
Tx2748	88	70	70	72
Tx7078	66	59	71	74
Zea mays				
B68	99	100	...	...
R177	2	0	...	...
33-16	5	6	...	...
Zea mexicana				
Teosinte	82	85	...	...
Heteropogon contortus				
Tanglehead	0	0	...	...

[a] Percentage of inoculated plants with systemic sorghum downy mildew 21 days after inoculation.
[b] Collections of *P. sorghi* made in Texas before 1978.
[c] Collection of *P. sorghi* made in 1979 in San Patricio County, Texas.

The older collection of *P. sorghi* represents the only known pathotype in Texas before 1978 and can be designated pathotype 1. The population of *P. sorghi* collected in 1979 and differentiated by its ability to induce high levels of sorghum downy mildew in CS3541 can be designated pathotype 2.

Variability for pathogenicity in *P. sorghi* increases the potential for damage from sorghum downy mildew. Breeders should attempt to diversify their sources of mildew resistance as quickly as possible to reduce the vulnerability of sorghum and corn.

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