

# Population Shift of *Sphaerotheca fuliginea* on Muskmelon from Race 2 to Race 1 in the Southeastern United States

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## ABSTRACT

Sowell, G., Jr. 1982. Population shift of *Sphaerotheca fuliginea* on muskmelon from race 2 to race 1 in the southeastern United States. *Plant Disease* 66:130-131.

The population of *Sphaerotheca fuliginea* on muskmelon at one location in Georgia changed from race 2 to race 1 during the period of 1969-1973. Race 1 apparently was the predominant race on muskmelon in most of the southeastern United States from 1974-1977.

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The powdery mildew fungus on cucurbits in the United States has usually been referred to *Erysiphe cichoracearum* DC. There is increasing evidence, however, that *Sphaerotheca fuliginea*

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(Schlecht.) Poll. is the causal agent (1,4,5,7). In 1969, Sowell and Corley (5) identified the powdery mildew population used in resistance testing in the greenhouse at Experiment, GA, as *S. fuliginea* race 2. This identification was based on the presence of fibrosin bodies in the conidia (1), the production of forked germ tubes by the conidia (1), and pathogenicity on muskmelon, *Cucumis melo* L. 'PMR 45.' Race 2 was also present in the field at the same location in 1968 and 1969 because the pathogen infected PMR 45 but did not infect the

PMR 6 cultivar (6). In 1971, plants of PMR 45 were not infected while cultivars susceptible to race 1 were infected. The present study was undertaken to determine whether a population shift from race 2 to race 1 had occurred.

## MATERIALS AND METHODS

In July 1971, I planted 25 seeds of each of seven cultivars of muskmelon in each of four replicated plots in a randomized block design in the greenhouse. Three-week-old plants were inoculated with conidia of the pathogen produced on summer squash (*Cucurbita pepo* L.) seedlings by excising heavily infected leaves and brushing the sporulating lesions over the leaves of the test plants grown in the greenhouse in flats. This was repeated until all the plants were inoculated. The disease index was recorded 2 wk after inoculation on a 0-5

**Table 1.** Severity of powdery mildew developing on muskmelon seedlings in 1971 greenhouse test following inoculation with *Sphaerotheca fuliginea* race 1

Entry	Disease index <sup>1</sup>
GA 47	0 a <sup>2</sup>
PMR 6	0 a
PMR 45	0.25 a
Gulfcoast	0.25 a
Planters Jumbo	1.75 b
Southland	2.25 b
Hales Best Jumbo	4.25 c

<sup>1</sup>Mean of four replicates. Severity is measured on a 0–5 scale, with 0 = no infection, 1 = trace to 20% of leaf area covered by the pathogen, to 5 = 81–100% of leaf area covered.

<sup>2</sup>Means not followed by the same letter are significantly different according to Duncan's multiple range test,  $P = 0.05$ .

scale of increasing severity as in previous tests (6).

In 1969 and in the 4-yr period of 1974–1977, sporulating lesions on infected muskmelon or squash leaves supplied by cooperators in three southeastern states or collected by the author in Georgia were brushed over the surface of leaves of healthy 4-wk-old PMR 45 and PMR 6 plants. In some tests, the cultivar Hales Best Jumbo was included as a control. After inoculation, the plants were held in a growth chamber at 25 C and 12 hr of light or in a greenhouse without supplemental lights at 25–31 C that was free of other plants infected by *S. fuliginea*.

## RESULTS

In the replicated greenhouse test, the mean disease index of PMR 45 did not differ significantly from that of PMR 6 or two other cultivars resistant to races 1 and 2 (Table 1). Hales Best Jumbo and other cultivars susceptible to race 1 were heavily infected. Therefore, I concluded that the race present in this test was race 1. The cultivar stock of PMR 45 used in this test was the same as that used in previous tests.

Most of the field samples obtained before 1974 were race 2, and most of the samples in 1974 and thereafter were race 1 (Table 2). All of the race 2 samples during the latter period were from coastal South Carolina and southern Florida. PMR 45 was not infected naturally in Experiment, GA, in 1976 and 1977, even in the same field experiments in which several

**Table 2.** Pathogenicity of *Sphaerotheca fuliginea* to PMR 45 muskmelon on samples collected in the southeastern United States in years shown

Location	Collector <sup>a</sup>	Year	Pathogenicity on PMR 45 <sup>b</sup>	Race
Bartow County, GA; field 1	GS	1969	+	2
Bartow County, GA; field 2	GS	1969	+	2
Spalding Co., GA; field 1	GS	1969	–	1
Spalding Co., GA; field 2	GS	1969	+	2
Auburn, AL; field	JN	1974	–	1
John's Island, SC; field	JH	1974	+	2
Charleston, SC; greenhouse	JH	1974	–	1
Experiment, GA; greenhouse	GS	1974	–	1
Charleston, SC; greenhouse	JH	1975	–	1
Experiment, GA; greenhouse	GS	1975	–	1
Charleston, SC; greenhouse	PN	1976	–	1
Auburn, AL; field	JN	1976	–	1
Leesburg, FL; field	GE	1976	± <sup>c</sup>	?
Experiment, GA; greenhouse	GS	1976	–	1
Experiment, GA; field <sup>d</sup>	GS	1976	–	1
Charleston, SC; greenhouse	PN	1977	–	1
Experiment, GA; greenhouse	GS	1977	–	1
Experiment, GA; field <sup>d</sup>	GS	1977	–	1
Immokalee, FL; field	DD	1977	+	2
Leesburg, FL; field	GE	1977	–	1
Charleston, SC; field	PN	1977	+	2

<sup>a</sup>Collectors of the samples included the author (GS), J. D. Norton (JN), J. C. Hoffman (JH), P. G. Nugent (PN), G. C. Elmstrom (GE), and D. G. Dougherty (DD).

<sup>b</sup>+ = pathogenic, – = not pathogenic.

<sup>c</sup>This isolate was weakly virulent on PMR 45.

<sup>d</sup>Data are based on observations of the absence of symptoms on PMR 45 in field plots where susceptible cultivars were severely infected; all other data based on inoculation of seedlings under controlled conditions.

cultivars that were susceptible to race 1 were severely infected.

## DISCUSSION

The apparent shift in the predominance of races of the powdery mildew fungus on muskmelon in the southeastern United States from race 2 to race 1 has serious implications for the cantaloupe breeder who is breeding for resistance to *S. fuliginea*. Most breeders in the southeastern United States who have been selecting progenies for resistance to the pathogen in the greenhouse or the field for the years 1974–1977 have probably selected for resistance to race 1. If race 2 again becomes predominant in the Southeast, as it apparently was before 1971, some of the new varieties that have been selected for resistance only to race 1 will be infected. All screening tests for resistance to *S. fuliginea* should include a cultivar resistant to race 1 only (PMR 45) and a cultivar resistant to both races 1 and 2 (PMR 6) to permit accurate monitoring of the races present.

Harwood and Markarian (3) found that a PMR 5 cultivar with resistance to races 1 and 2 contained the genes  $Pm^1$  and  $Pm^2$ . It is important for the plant breeder to maintain both of these genes in his breeding lines to minimize genetic vulnerability as suggested by Crill (2).

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