Race Differentiation in Fusarium oxysporum f. sp. carthami

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ABSTRACT

A third pathogenic race of *Fusarium oxysporum* f. sp. *carthami* is established by its virulence on A14154, a cultivar of safflower resistant to two races of the pathogen differentiated by their virulence on cultivar Nebraska 6. Safflower introductions and breeding materials have been identified which provide a source of germ plasm with a high level of resistance to the three races. Phytopathology 60:1706.

Two races of *Fusarium oxysporum* Schlecht. f. sp. *carthami* Klis. and Hous. which incite wilt of safflower (*Carthamus tinctorius* L.) have been described (1). Both are pathogenic to safflower cultivars US10, Gila, and Pacific 1 and other safflower lines, but are differentiated on Nebraska 6 (N6), which is resistant to race 1. Some safflower introductions and breeding line N4051 are resistant to both races, although some isolates of race 2 were found to differ in virulence on certain safflower introductions. To determine whether another race could be identified among the race 2 isolates, pathogenicity tests were continued with safflower introductions and other cultivars.

TABLE 1. Reaction of selected safflower plant introductions and cultivar Nebraska 6 to race 1 and different race 2 isolates of *Fusarium oxysporum* f. sp. *carthami*

Isolate	P.I. 251,288	P.I. 250,822[a]	P.I. 253,893	Nebraska 6	Race designation
FYBy	100[b]	100	100	100	I
FDel	90	100	100	8	II
FAr	83	82	67	6	II
N6-2	78	70	82	11	II
N6-64	62	78	62	0	II
N6-1	45	75	70	0	II

[a] Selection different from P.I. 250,822 (1, Table 1).
[b] Per cent plants healthy of 36 plants, 6 plants in each of 6 replications.

TABLE 2. Differentiation of 3 races of *Fusarium oxysporum* f. sp. *carthami* on two safflower cultivars

Isolate	Nebraska 6	A14154	Race designation
FYBy	100[a]	100	I
FDel	10	100	II
N6-1	0	10	III

[a] Per cent plants healthy of 100 plants/cultivar-isolate combination.

Inoculum was prepared as described (1) and mixed with soil at the rate of 1.5 g/100 g soil. Plants were grown in infested soil under natural light and an ambient temp of 23 to 27 C. Race 2 isolates selected for testing (Table 1) gave disease ratings of 5.0-6.0 on N6 in previous tests (1).

An additional race is indicated by the reactions of P.I.251,288, P.I.250,882, and P.I.253,893 to race 2 isolates (Table 1). Isolate FDel differs from FYBy in the N6 reaction only, but differs from the other isolates in the reaction of one or more safflower introductions. According to the data (Table 1), the most virulent of the isolates in the test were N6-64 and N6-1.

Safflower cultivar A14154 was used in an attempt to differentiate isolates FDel and N6-1 more clearly. Plants were grown in soil mixed with inoculum at the rate indicated above, and soil temp was maintained at approx 25 C. Results (Table 2) 4 weeks after planting substantiate the existence of 3 races.

Safflower breeding line Nebraska N4051, P.I.250,882, and P.I.251,267 are highly resistant to isolates of f. sp. *carthami* at an inoculum rate of 1.5 g/100 g soil (1). All were resistant to races 1 and 2 at inoculum rates of 3 and 5 g, but some plants of each developed symptoms when inoculated with race 3 at rates of 3 and 5 g. These safflower materials provide a source of germ plasm with a high level of resistance for use in breeding programs.

LITERATURE CITED

1. KLISIEWICZ, J. M., & C. A. THOMAS. 1970. Pathogenic races of *Fusarium oxysporum* f. sp. *carthami*. Phytopathology 60:83-84.