Cowpea Wilt *Fusarium oxysporum* f. sp. *tracheiphilum* Race 1 from Nigeria

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ABSTRACT

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An isolate of the cowpea wilt fungus of unknown race received from Nigeria in 1975 was used along with single-spore isolates of races 1, 2, and 3 of *Fusarium oxysporum* f. sp. *tracheiphilum* to inoculate pure lines of cowpea cultivars Groit, Chinese Red, and Arlington, which serve as differentials for determining these races. Cultivars from the germ plasm bank of the International Institute of Tropical Agriculture in Nigeria were also included. Wilt reactions of the cultivars showed that the Nigerian isolate belonged to race 1.

In 1950, we described two races of *Fusarium oxysporum* f. sp. *tracheiphilum* (E. F. Sm.) Snyd. & Hans. in South Carolina that caused wilt of cowpea (*Vigna unguiculata* (L.) Walp.) (3). Race 1 also caused wilt of 'Yelredo' soybean (*Glycine max* (L.) Merr.) (3) and 'Encore' chrysanthemum (*Chrysanthemum morifolium* (Ramat.) Hemsl.) (4). Hare (5) found three races in Mississippi in 1953 with the cowpea cultivar Arlington as the differential for race 3, and Toler et al (13) reported three races in Georgia in 1963. Oyekan (8) reported cowpea wilt in Nigeria in 1975 without indicating the race(s) involved and supplied us with an isolate of the fungus.

Cowpea, the grain legume most traded and consumed in tropical Africa (12), is a major source of protein for rural and poor urban people (14). The increasing importance of cowpea production in some regions of Africa and the wide distribution of the Fusarium wilt originally described by Smith (11) prompted us to determine the race of the *Fusarium* isolate from Nigeria.

MATERIALS AND METHODS

Twenty cowpea seeds, treated with a 5% sodium hypochlorite solution for 5 min, were planted evenly in a circle 2.5 cm from the periphery and 2.5 cm or less deep in steam-sterilized sand in 8-L glazed pots (22-cm diameter). The plants were given a nutrient solution (2) and eventually were thinned to 10–12 plants of uniform size per pot.

At inoculation, the roots were cut by pressing an inverted Büchner funnel (10-cm diameter) into the center of the pot, and 3-day-old liquid inoculum of microspores, bud cells, and fragments of mycelium was poured around the roots. The roots were cut for the first inoculation after the plants had formed the first true leaves, which was beyond the stage when damping-off might be confused with wilt. A second inoculation was given 5–7 days later. The greenhouse temperature was set at 28 C, but variations of several degrees occurred occasionally for short periods. Further details of methods are given elsewhere (1,2).

Seeds were received from the USDA Regional Plant Introduction Station, Experiment, GA; the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria; and W. W. Hare, who supplied pure lines of the three differential cultivars. The isolates of f. sp. *tracheiphilum* were races 1, 2, and 3 from Georgia (courtesy R. W. Toler), races 1 and 2 from South Carolina, and an unknown race from Nigeria (P. O. Oyekan).

RESULTS AND DISCUSSION

The results of inoculations, given in Table 1, serve to differentiate races 1, 2, and 3 as we understand them and clearly define the Nigerian isolate as race 1. This was reported to Oyekan (*personal communication*). However, in 1977 no races had been determined after Oyekan tested 200 cowpea lines in the greenhouse and field (9,10). He did not differentiate the isolates used in the screening tests for resistance and did not state whether they were derived from single spores. Hare (6) isolated two races from single plants in

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Table 1. Results of inoculation of cowpea cultivars and lines with three races of *Fusarium oxysporum* f. sp. *tracheiphilum* and an isolate from Nigeria

Cultivar	Isolate			
	Nigeria	Race 1	Race 2	Race 3
Groit	29/34[a]	37/43	0/26	0/10
Chinese Red	0/13	0/19	78/90	14/16
Arlington	0/15	0/49	7/88	94/104
Magnolia	0/8	0/10	0/29	0/18
TVu 347	0/12	0/12	0/25	9/12
TVu 19770-D Vita 4	0/10	1/11	0/8	8/9
Iron PI 293520	0/12	0/11	0/21	0/15
Iron TVu 193	0/12	0/12	2/18	1/12
Iron TVu 232[b]	1/11	1/12	7/12	15/15
Iron TVu 233	0/11	1/13	0/17	10/11
Iron TVu 990[b]	0/13	0/11	0/28	0/30
Iron TVu 1072[c]	0/12	0/13	0/12	0/16
Iron TVu 1611[d]	0/19	0/19	0/17	0/28

[a] Number of wilted plants (external symptoms)/number of plants tested.
[b] All dark seed.
[c] Mixture of dark and light seed.
[d] Dark and light seed tested separately but results combined.

the field and three races from a plant in the greenhouse.

Oyekan (10) reported that cultivars Iron, Magnolia, and Arlington, among others, were susceptible; however, they were resistant to the isolate we received (Table 1). Since Iron is resistant to races 1, 2, and 3, its wilting suggested another race. However, because we have found that different lots of seed with the same name sometimes give opposite wilt reactions, we obtained seed of Iron (PI 293520) from the Regional Plant Introduction Station germ plasm bank and six different lots from the IITA. All produced plants resistant to the isolates of race 1 from Nigeria and South Carolina (Table 1). The seeds of the IITA samples were mixed in color, and some were not the "buff" mentioned by Orton (7). However, there was no correlation between seed color and wilt reaction.

Oyekan (9) reported TVu 347 as resistant; we agree for races 1 and 2 (Table 1) but found it susceptible to race 3, which suggested that this race may not occur in the Nigerian plots. However, wilting of Arlington in Oyekan's tests indicated that race 3 was involved, if the cultivar he used had the same genome as the one we had from W. W. Hare and the USDA germ plasm bank. If the experiments in the United States and Nigeria were conducted under fairly similar environmental conditions with similar methods, the divergent results suggest that new races may be present in Nigeria and that other differential cultivars may be necessary to identify them.

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