Occurrence of *Fusarium oxysporum* f. sp. *cucumerinum* on Greenhouse-Grown *Cucumis sativus* Seed Stocks in North Carolina

S. F. JENKINS, JR., Professor, Department of Plant Pathology, and T. C. WEHNER, Assistant Professor, Department of Horticultural Science, North Carolina State University, Raleigh 27650

ABSTRACT

Jenkins, S. F., Jr., and Wehner, T. C. 1983. Occurrence of *Fusarium oxysporum* f. sp. *cucumerinum* on greenhouse-grown *Cucumis sativus* seed stocks in North Carolina. Plant Disease 67: 1024-1025.

Fusarium wilt of cucumber (*Cucumis sativus*) occurred in a greenhouse used to increase seed stocks. The causal organism was isolated from the stems, peduncles, fruit, and seed of plants growing in the greenhouse and also from seed of three of 88 plant introduction (PI) lines tested later. Monoconidial isolates from both the infected plants growing in the greenhouse and seed of the three PI lines were identified as *Fusarium oxysporum* f. sp. *cucumerinum* race 1. Inoculation of race 1-susceptible cultivars MSU 9519, Chipper, and Ashley resulted in wilt, but inoculation of race 1-resistant PI 390265 did not result in wilt.

Fusarium wilt of cucumber (*Cucumis sativus* L.) occurs in many parts of the world, causing serious economic damage (2–5). The pathogen, *Fusarium oxysporum* Schlecht. f. sp. *cucumerinum*, is host-specific to cucumber (1,2,4).

In the winter of 1979, *F. oxysporum* f. sp. *cucumerinum* was isolated from wilted cucumber plants growing in soil beds in a greenhouse used to increase cucumber seed stocks of advanced breeding and plant introduction (PI) lines. The purpose of this paper is to report the occurrence of Fusarium wilt on cucumber in North Carolina and our findings on contamination of seed as a possible source of primary inoculum.

MATERIALS AND METHODS

Isolates of *F. oxysporum* f. sp. *cucumerinum* used in these studies originated from stems, fruit and seed of infected greenhouse plants and from three of 88 PI seed lots. Diseased stem, peduncle, and fruit tissues were surface-disinfested in a 0.5% sodium hypochlorite solution for 10 min and plated on acidified potato-dextrose agar (PDA). Twenty seeds from each seed lot tested were also disinfested and plated on acidified PDA. Single-conidial isolates were selected from colonies that emerged from tissues and seeds and were maintained in test tubes of nonacidified PDA.

Primary inoculum used for identification of each isolate was prepared by incubating the fungus in a liquid modified Richards solution in shake culture for 72 hr at 25 C in 12 hr dark and 12 hr light (7). The primary inoculum consisted of a suspension of microconidia and mycelial fragments that were collected on qualitative filter paper and resuspended in deionized water equal to the original volume of Richards solution. Isolates were assayed by inoculating wounded roots of 3-wk-old cucumber plants of four lines used as differentials: MSU 8519, Chipper, PI 390265, and Ashley, as proposed by Armstrong et al (1). The test plants were seeded in seven rows of seven plants each in wooden flats 35 × 51 × 8 cm containing a soil:sand:peat mix (3:1:1, v/v). Roots were cut with a knife between the 35-cm-long rows of plants and inoculum (about 10^5 propagules per milliliter) was added to the trench at 50 ml/row (350 ml/flat). The plants were held for 5 days at 23–28 C, then rated daily for disease symptoms.

RESULTS AND DISCUSSION

Eighteen of 19 isolates of *F. oxysporum* f. sp. *cucumerinum* obtained from the stems, peduncles, or fruit of cucumbers being grown for seed increase were pathogenic on cultivars MSU 8519, Chipper, and Ashley. PI 390265 is reported to be race 1 wilt-resistant and showed no vascular discoloration. Susceptible inoculated plants wilted within 21 days. All reisolates from the inoculated symptomatic plants were identical in colony morphology to the isolates used originally to inoculate the plants. The isolates were thus identified as race 1 of *F. oxysporum* f. sp. *cucumerinum* (1).

The fungus was also isolated from the seed of the same plants, but to a much lesser extent. About 4% of the seed from six of 46 fruit from 62 symptomatic plants yielded pathogenic isolates of *F. oxysporum* f. sp. *cucumerinum*. When the seeds were surface-disinfested with 0.5% sodium hypochlorite, no pathogenic isolates were recovered, indicating the fungus was present primarily on external seed parts.

Four isolates of *F. oxysporum* f. sp. *cucumerinum* were obtained from seed of three of 88 PI lines tested (175960, 211986, and 137844). All four isolates were pathogenic on cultivars MSU 8519, Chipper, and Ashley and nonpathogenic on PI 390265. As in the case of infected plants, four isolates were obtained only from seed that had not been surface-disinfested.

Takeuchi et al (6) found that *F. oxysporum* f. sp. *cucumerinum* migrated rapidly in the vascular bundles of cucumber stems and assumed that migration from stems into fruits and seeds occurred at a low rate. We also found that this pathogen could be isolated from fruit of Fusarium wilt-susceptible cucumber plants and that seed transmission occurred at a low but significant rate.

Takeuchi et al (6) theorized that cucumber seeds became infected by multiplication of the pathogen in the decomposing fruit wall and parenchyma surrounding the seeds before the seed were separated from the fruit at harvest. They also stated that the pathogen showed high survival in long-term storage. The seed of the PI lines from which we isolated the fungus had been in storage at least 1 yr.

Fusarium wilt of cucumber has not been observed or reported in North Carolina before this report. About 16,000 ha of cucumber are grown in North Carolina, including a large spring planting and a smaller late-summer planting. The organism causing Fusarium wilt of cucumber, other than occurring in the seed stock, has not become a recognized problem in growers' fields.

Paper 8455 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh 27650.

Accepted for publication 24 March 1983.

The publication costs of this article were defrayed in part by page charge payment. This article must therefore be hereby marked "*advertisement*" in accordance with 18 U.S.C. § 1734 solely to indicate this fact.

ACKNOWLEDGMENTS

We thank C. W. Holloway and R. R. Horton, Jr., for technical assistance.

LITERATURE CITED

1. Armstrong, G. M., Armstrong, J. K., and Netzer, D. 1978. Pathogenic races of the cucumber-wilt *Fusarium*. Plant Dis. Rep. 62:824-828.
2. Booth, C. 1971. The genus *Fusarium*. Commonwealth Mycological Institute, Kew, Surrey, England. 237 pp.
3. Netzer, D., Niego, S., and Galan, E. 1977. A dominant gene conferring resistance to Fusarium

wilt in cucumber. Phytopathology 67:525-527.
4. Owen, J. H. 1955. Fusarium wilt of cucumber. Phytopathology 45:435-439.
5. Owen, J. H. 1956. Cucumber wilt caused by *Fusarium oxysporum* f. *cucumerinum* n. f. Phytopathology 46:153-157.
6. Takeuchi, S., Ogawa, K., and Nomura, Y. 1978. Mechanism of seed transmission of Fusarium wilt of cucumber and bottle gourd, and improvement of a method for the seed-disinfection test. J. Cent. Agric. Exp. Stn. 28:49-76.
7. Winstead, N. N., and Walker, J. C. 1954. Production of vascular browning by metabolites from several pathogens. Phytopathology 44:153-158.