

PHYTOPATHOLOGICAL NOTES

Effect of the Tobacco Cyst Nematode, *Heterodera tabacum*, on Severity of *Verticillium* and *Fusarium* Wilts of Tomato

P. M. Miller

Department of Plant Pathology and Botany, The
Connecticut Agricultural Experiment Station, New
Haven 06504.

ABSTRACT

In greenhouse studies, the development of *Verticillium* wilt was more severe in tomatoes growing in soil to which 100 cysts of *Heterodera tabacum* had been added, than in soil without the nematode. Less *Fusarium* wilt developed in tomatoes growing in soil containing *H. tabacum* than in soil without the nematode.

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Additional key words: Vascular wilts, plant-parasitic nematodes.

Parasitism by nematodes may make plants more susceptible to some fungal diseases, particularly the vascular wilts. The meadow nematode, *Pratylenchus penetrans*, has been found to increase *Verticillium* wilt of eggplant (5); and the rootknot nematode, *Meloidogyne incognita*, has been reported to increase *Fusarium* wilt of tomato (4). Since both tomatoes and eggplants are hosts of the tobacco cyst nematode, *Heterodera tabacum*, we tested the influence of this nematode on the severity of *Fusarium* wilt and *Verticillium* wilt of tomato.

The fungi were grown on a shaker at 25 C in 125-ml Erlenmeyer flasks containing 45 ml of casamino acid media (2), *Fusarium oxysporum* f. sp. *lycopersici* for 7 days and *Verticillium albo-atrum* for 14 days. The contents of four flasks of each fungus were combined, macerated in a Waring Blendor, and diluted to 200 ml. These suspensions, and their 10-fold dilutions, were used

as the high and low inoculum levels of the pathogens. Bonny Best tomato plants, 6 wk old and about 2 cm tall, with part of the roots cut off were dipped into the mycelial suspensions. Of 12 plants used for each pathogen at each inoculum level, six were planted separately in 474 ml (16-oz) styrofoam cups in unsterilized soil containing over 100 cysts of *H. tabacum* per 100 g of soil, and the other six were planted in unsterilized soil without *H. tabacum*. Each experiment included a set of plants treated in the same way, except that they were not dipped into a mycelial suspension. After 4 wk in the greenhouse, each plant was rated for disease by averaging the number of browned vascular bundles at each node (2). After they were rated for disease, the stems were dipped into alcohol, and three slices cut from each stem were placed on potato-dextrose agar containing 100 µg/liter of streptomycin sulfate. Growth of the fungal pathogens from the stem sections was recorded. To measure invasion of roots by *H. tabacum*, six 2-cm-long root sections from six plants were macerated in a Waring Blendor and *H. tabacum* larvae in the root particles were counted. All experiments were repeated and the results averaged.

The effect of cyst nematodes on both diseases is given in Table 1. Both wilts were so severe at the high inoculum level that no effect of *H. tabacum* could not be detected. At the low inoculum level, however, *Verticillium* wilt was more severe in soil infested with *H. tabacum* than in uninfested soil. *Fusarium* wilt was less severe in the presence of *H. tabacum*. *F. oxysporum* f. sp. *lycopersici* and *V. albo-atrum* were isolated from all plants inoculated with each pathogen. Neither was isolated from plants that had not been dipped into mycelial suspensions. About 25 *H. tabacum* larvae per cm of root were found growing in nematode-infested soil but none was found in roots grown in noninfested soil.

It is not surprising that root invasion by *H. tabacum* produces opposite effects on the severity of *Verticillium* wilt as compared to the effects on *Fusarium* wilt of tomatoes for the diseases respond differently to other

TABLE 1. Severity of wilt development in tomato plants root-inoculated with two inoculum levels of either *Verticillium albo-atrum* or *Fusarium oxysporum* f. sp. *lycopersici*, and planted in soil with or without *Heterodera tabacum*

Fungus and inoculum level ^a	<i>H. tabacum</i>		Disease rating ^b
	No. cysts in 500 g of soil	No. larvae found per cm of root	
0	0	0	0
0	100	25	0
<i>V. albo-atrum</i>			
10 x	0	0	2.7
10 x	100	22	2.5 ^c
x	0	0	1.5
x	100	26	2.7
<i>F. oxysporum</i> f. <i>lycopersici</i>			
10 x	0	0	3.0 ^d
10 x	100	20	2.9 ^c
x	0	0	2.5 ^c
x	100	23	1.7
(LSD, <i>P</i> = 0.05)		8.0	0.4

^aFungus inoculum levels were 10 x = undiluted mycelial homogenate, and x = 10-fold dilution.

^b0 = no browning. 3 = severe browning. Average of two tests, six plants per test each treatment.

^cOne plant dead.

^dTwo plants dead.

factors as well. The development of Verticillium wilt is less severe, and that of Fusarium wilt is more severe with increased nitrogen (1, 2, 3, 6). Moreover, tomato cultivars resistant to one disease may be susceptible to the other.

The effects of *H. tabacum* on two wilt diseases may be due to changes in physiology of the roots by the presence of the nematode. *H. tabacum* produces hormones or similar substances that cause formation of giant cells in roots and these substances could alter resistance of roots to entry by disease fungi.

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