

Infection of additional hosts of *Synchytrium endobioticum*, the causal agent of potato wart disease: 2. Tomato, tobacco and species of *Capsicastrum*, *Datura*, *Physalis* and *Schizanthus*¹

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Seventy-two cultivars of tomato, six cultivars of tobacco, and species of *Capsicastrum*, *Datura*, *Physalis* and *Schizanthus* were inoculated with races 2 and 8, or race 2 only of *Synchytrium endobioticum*. The six cultivars of tobacco tested were resistant, but all tomato cultivars and other species tested were susceptible.

Can. Plant Dis. Surv. 59:1, 3-6, 1979

Soixante-douze cultivars de la tomate, six cultivars du tabac et les espèces des genres *Capsicastrum*, *Datura*, *Physalis* et *Schizanthus* ont été inoculées avec les races 2 et 8, ou la race 2 seulement de *Synchytrium endobioticum*. Les six cultivars de tabac qui ont été testés se sont montrés résistants; par ailleurs tous les cultivars de la tomate et des autres espèces n'ont pas manifesté de résistance.

Tomato production is a growing industry in Newfoundland, and is presently of some importance to the local (Newfoundland) economy (1). Much of the tomato production, however, is pursued in areas known to be infested with one or more races of *Synchytrium endobioticum* (Schilb.) Perc. (2). Of fifty-one tomato cultivars previously tested at this Station for their reaction to *S. endobioticum*, none was found to be immune to European race 2 or 8 under our experimental conditions.

Since it is well known (3) that *S. endobioticum* can be transferred experimentally to Solanaceous species other than tomato, it was decided to examine the infection reactions of some of the commoner species (particularly some floriculture specimens) to the Newfoundland wart races, along with other tomato cultivars.

The study reported here was carried out to provide further information on the susceptibility of tomato cultivars and selected Solanaceous species to *S. endobioticum*. This study was also done with the hope that one or more species might prove useful for assay or as an indicator of the presence of the wart disease fungus.

Materials and methods

Seventy-two cultivars of tomato (*Lycopersicon esculentum*), six cultivars of tobacco (*Nicotiana tabacum*), and species of *Capsicastrum* (Jerusalem Cherry), *Datura* (Angel's Trumpet), *Schizanthus* (Butterfly Flower) and *Physalis* were tested.

The seedlings of all cultivars and species were treated the same in regard to cultural practices, and grown

under conditions similar to those used in the earlier study (1). The methods of inoculation included: a) transplanting seedlings into sporangia (resting spore)-infested mix (1000 sporangia/g mix); b) dragging root systems through sporangial slurries, and then planting the seedlings in non-infested mix. The potting mix was sterilized peat:perlite:water, 2:1:1/2 (v/v).

Tomato seedlings were inoculated at the four-leaf stage (about 4-wk old); other species were inoculated at 1, 2, 3 or 4 wk after emergence. Seedlings were examined macro- and microscopically (25 X) at 4 wk after inoculation (Figure 1). The seedlings were indexed at harvest as in the earlier study: L 5-20 resting spores; M 20-100; H > 100. European race 8 was used in some of the tomato tests (Table 1), and race 2 was used to inoculate all the tomato, tobacco and other species tested (Tables 1, 2 and 3). Generally, the seedlings were top-irrigated, although a test was made of bottom-irrigation to observe its influence on disease expression.

Results and discussion

It can be seen (Tables 1 and 2) that all the tomato cultivars tested were susceptible to race 2. These cultivars tested with race 8 (Table 1) were also susceptible to that race. These results were predictable since the same pattern appeared in the earlier tests (1). Small differences in virulence between races 2 and 8 were found. It was found in the earlier study that 13% and 7% of the specimens, respectively, were free from infection by race 8 and race 2. In the present study, the percentage escapes were 2 and 5, for races 8 and 2 respectively. Since only five seedlings were used in each test, it is likely that these differences reflected experimental errors. Neither mode of inoculation nor irrigation influenced the incidence of disease among the tomato cultivars.

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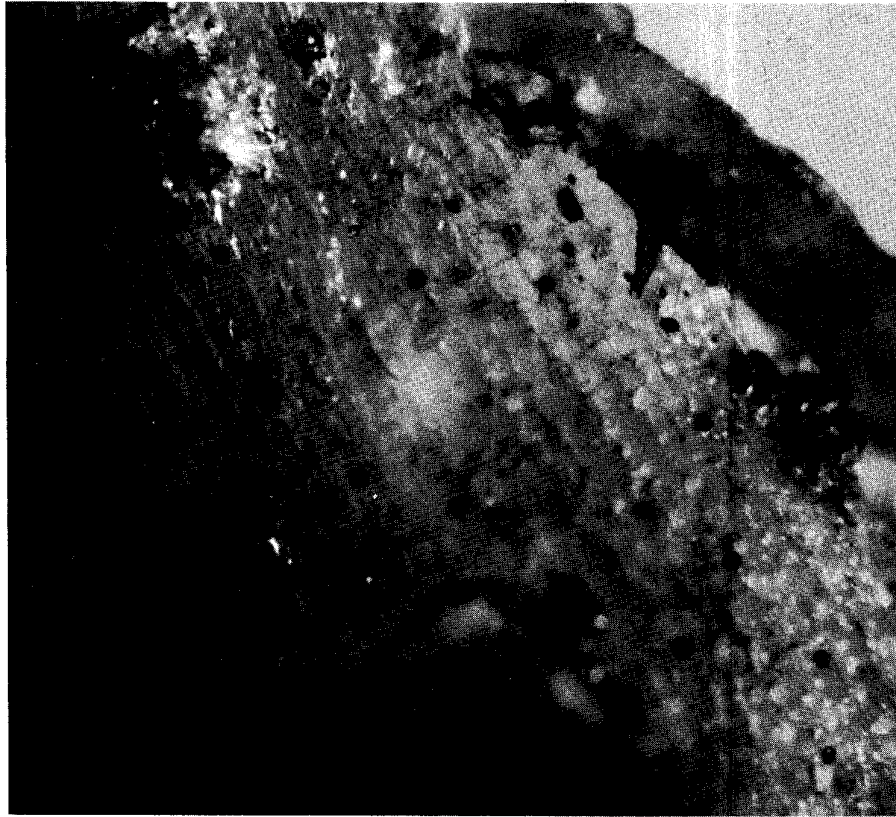


Figure 1. Length of infected tomato root with resting sporangia of *Synchytrium endobioticum*. They appear in the photograph as black dots: magnification 25 X, enlarged 4.7 X.

Table 1. Infection of 36 tomato cultivars inoculated with races 2 and 8 of *Synchytrium endobioticum*.

Tomato cultivar	No. of seedlings ¹ / infection level ²					
	Race 2			Race 8		
	L	M	H	L	M	H
Basket Pak	3	2	0	0	5	0
Beef Globe Master Hybrid	2	3	0	2	3	0
Better Boy Hybrid	2	3	0	1	4	0
Burpee Hybrid	3	2	0	0	3	2
Burpee's Pixie Hybrid	2	3	0	0	3	2
Burpee's Sunny Brook Earliana	1	0	4	0	3	2
Cardinal	2	3	0	2	3	0
Delicious	1	4	0	0	4	1
Early Girl Hybrid	5	0	0	1	4	0
Glamour	3	2	0	2	3	0
Golden Queen	4	1	0	3	1	0
Heinz 1370	4	1	0	3	2	0
Heinz 1439	0	4	1	1	1	3
Jet Star	3	2	0	2	3	0
Jubilee	1	3	1	0	4	1
Marglobe	4	1	0	2	3	0
Michigan Ohio	0	3	2	0	4	1
Michigan Ohio Forcing	1	4	0	3	2	0
Monalucie	1	4	0	1	3	1
Moreton Hybrid	4	1	0	3	2	0

Table 1. (cont.)

Tomato cultivar	No. of seedlings ¹ / infection level ²					
	Race 2			Race 8		
	L	M	H	L	M	H
Ohio WR	3	2	0	1	3	1
Orange Queen	3	1	0	3	2	0
Ottawa 78	0	4	1	0	5	0
Outdoor Girl	0	4	1	1	3	1
Oxhart	3	0	1	2	3	0
Rapids	2	2	0	3	2	0
Rushmore VF	3	2	0	0	3	2
Setmore	1	4	0	1	4	0
Small Fry	5	0	0	0	4	1
Star Cross	3	2	0	0	5	0
Stokes Early Hybrid	1	1	0	3	2	0
Tiny Tim	4	1	0	4	1	0
Tropic	3	2	0	1	4	0
Tuckcross	0	2	3	0	2	3
Ultra Girl VFN	4	1	0	4	1	0
Vinequeen	1	2	2	0	3	2

¹Five seedlings used in each test

²Infection level based on No. of resting spores/seedling:

L = 5-20 : M = 20-100 : H = > 100.

Table 2. Infection of 36 tomato cultivars inoculated with race 2 of *Synchytrium endobioticum*.

Tomato cultivar	No. of seedlings ¹ / infection level ²		
	L	M	H
Beefmaster	0	1	4
Burpeana Early Hybrid ⁴	1	4	0
Burpee's Big Boy Hybrid ⁴	3	2	0
Campbell ⁴	0	5	0
Early Chatham ⁴	2	3	0
Early Red Chief	1	4	0
Early Summer Sunrise ⁴	1	3	1
Fireball ⁴	2	3	0
Gardener ⁴	0	4	1
Heinz 1350	0	3	2
Jet Fire	3	2	0
Moneymaker ⁴	3	1	1
New Yorker	5	0	0
Ohio MR 12 ⁴	2	3	0
Ohio WR 25 ⁴	4	1	0
Patio Hybrid ⁴	4	1	0
Pearson	0	5	0
Presto	3	2	0
Ramapo ⁴	2	3	0
Red Top ⁴	4	1	0
Rutgers ⁴	4 ³	0	0
Scotia ⁴	1	3	1
September Dawn	4	1	0
Star fire	4	1	0
Sunray	3	2	0
Supersonic	1	4	0
Swift	2	3	0
Traveller	0	2	3
Tuck Queen ⁴	3	2	0
Vantage	1	3	1
Veegan	2	3	0
Veemore ⁴	3	1	1

Table 2. (cont.)

Tomato cultivar	No. of seedlings ¹ / infection level ²		
	L	M	H
Veeroma ⁴	0	4	1
Vetomold ⁴	0	5	0
Vivid	0	4	1
Wonder Boy ⁴	1	4	0

¹Five seedlings used in each test.

²Infection level based on No. of resting spores/seedling:
L = 5-20 sporangia/plant; M = 20 = 100; H = >100.

³One seedling failed to grow.
⁴Inoculated by slurring roots

Table 3. Number of resting spores found in the root system of seedlings inoculated with *Synchytrium endobioticum* at different times after emergence.

Species or cultivar ¹	Week after emergence			
	1	2	3	4
<i>Nicotiana tabacum</i>				
White	0	0	0	0
Crimson King	0	0	0	0
Dwarf Crimson	0	0	0	0
Lime Green	0	0	0	0
Daylight Sensation	0	0	0	0
White Bedder	0	0	0	0
<i>Schizanthus</i> sp.	0.1.1.4	0.0,0,4	0.0.1	0.1.12
<i>Physalis franchetii</i>	0,0,1,3	1.2.3.4	0.3,3,9	2,3,7,10
<i>Capsicastrum nanum</i>	2,4,10,15	3.6.1.1	3.6.7	0.1.49
<i>Datura</i> sp.				
Fastuosa	0.4	7.9	-	-

¹Five seedlings per week inoculated by slurring.

The numbers of resting spores in the root systems of the other test seedlings were generally low (Table 3). Although other workers have succeeded in infecting tobacco species (not *tabacum*) under experimental conditions (4), we were unsuccessful. Susceptibility varied with time: increasing (*Physalis franchetii*) or decreasing (*Capsicastrum nanum*) with time after emergence.

It is concluded, therefore, that tomato is generally and equally susceptible to races of *S. endobioticum*. Tomato is seemingly infected with ease irrespective of the modes of inoculation or water supply. None of the other species tested appear to warrant further work on them. The use of tomato as an assay and indicator plant will be pursued, as will its reactions to other wart races present in Newfoundland.

Acknowledgement

I wish to thank Janet Coombes, technician, for her patient work in counting resting spores.

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