Infection of additional hosts of Synchytrium endobioticum, the causal agent of potato wart disease: I. Tomato

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Fifty-one commercial tomato cultivars were inoculated with European races 2 and 8 of ***Synchytrium endobioficurn.*** All cultivars were infected. This is the first study of the responses of additional hosts in Newfoundland to potato wart disease.

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On a inoculé 51 cultivars commerciaux de tomate avec les races europeennes 2 et 8 de ***Synchytrium endobioficum.*** Tous les cultivars ont ete infectes. C'est la premiere etude des reactions d'hôtes additionnels a la tumeur verruqueuse de la pomme de terre a Terre-Neuve.

In 1973, the combined Newfoundland and Prince Edward Island tomato growing industry ranked sixth in production among Canada's Provinces (12). There are now about 20 Newfoundland operators producing tomatoes under 0.7 hectare of glass or plastic (M. Stapleton, personal communication).

Cotton, in 1916, demonstrated that solanaceous plants other than the potato, *Solanum tuberosum* L., can be attacked by *Synchytrium endobioticum* (Schilb.) Perc. (1). Four years later the first report was made of infection of tomato, *Lycopersicum esculentum* Mill., in wart-infested soil (8). Other studies, notably in the United States (13), England (9), Germany (2, 6, 7) and India (10), have demonstrated that tomato tissue is highly susceptible.

Since potato wart disease is endemic in Newfoundland (4), information on the susceptibility of tomato varieties was of importance to local growers. No previous study had reported the inoculating fungal race, and since several races exist in Newfoundland tomato susceptibility tests were made with European races 2 and 8, the most common races of S. *endobioticum* in Newfoundland.

Materials and methods

Tomato seedlings were raised in a controlled environment room (3). Seed was surface sterilized for 2 min in 1% formalin, rinsed in sterile distilled water, and planted in sterilized potting mix (peat:perlite, 2:1, v/v). At the four-leaf stage, five seedlings of each cultivar were transferred to 5.1-cm pots containing wart-infested potting mix and grown under the following conditions: photoperiod, 16 h/day; temperature, 22°C; R.H., 80%; watering regime, daily; fertilization, weekly, van der Elst's solution (10). Seedlings were examined macro- and microscopically (25 X) 4 wk after inoculation. The number of resting spores/plant was recorded and the plants indexed: L 5-20 resting spores; M 20-100; H 7100. In preliminary experiments to determine the most effective means of inoculation, seedlings were either rooted in infested mix, planted with wart pieces placed in contact with plant stem bases, or subjected to Hille's (5) immersion-inoculation technique.

Results and discussion

Attempts were made to duplicate Hille's immersion-inoculation technique but no infection developed in our plants. No reason could be found for this failure, although parallel experiments using both races with infested potting mix gave positive results. Hille developed his technique for large-scale screening purposes but, as our study was not confounded by the factor of massive screening, our approach was developed along the lines described. The potting mix method was selected since it offered better control over inoculum density; however the same infection picture developed using the mix or the wart piece inoculation technique.

Searching for resting spores was time consuming since the roots of tomato are attacked. This is in contrast with potato cultivars in which roots are not known to be attacked. Generally less than 20 resting spores were recorded on 50% of the plants at stem bases or on lateral roots attached at stem bases. The fungus occurred as isolated or small groups of resting spores. The response of the tomato cultivars to infection appears to be of a different order than that of potato since no galls were found on the tissues.

This study, presenting the first data on the reaction of additional hosts to Newfoundland races of the potato wart fungus, agrees with other results showing that tomato tissue is susceptible to potato wart infection. Although each cultivar was attacked by races 2 and 8, some difference in virulence was found because up to 13% of the tomato specimens escaped infection by race 8, and 7% escaped infection by race 2.

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Table 1. Infection of 51 tomato cultivars inoculated with two races of the potato wart disease fungus *Synchytrium endobioticum*

Tomato cultivar	No. of seedlings*/ infection level**					
	Race 2			Race 8		
	L	M	H	L	M	H
Vogue	5	0	0	4	1	0
Stokesalaska	3	0	0	4	1	0
Hybrid Red No. 22	5	0	0	3	2	0
Rocket	2	2	1	2	2	0
Vision	5	0	0	5	0	0
Burpee's VF	2	2	0	5	0	0
Quebec No. 13	5	0	0	1	0	0
Quebec No. 314	4	0	0	3	0	0
Nova	5	0	0	0	1	0
Campbell No. 28	3	0	0	1	3	0
Veeset	2	2	0	3	1	0
Spring Giant Hybrid	3	0	0	1	0	0
Rideau	4	1	0	3	0	0
Stakeless	5	0	0	3	0	0
Campbell No. 19	4	0	0	4	0	0
Crackproof Pink	4	1	0	3	0	0
Early Fireball	1	4	0	4	0	0
Bush Beefsteak	2	3	0	3	2	0
Ultra Boy VFN	3	2	0	4	1	0
Valiant	4	0	0	4	0	0
New Yorker	0	2	3	5	0	0
Livingstone Globe	3	0	2	4	0	0
Earliest of All	3	0	0	3	0	0
Ponderosa	0	2	2	4	0	0
San Marzano	2	3	0	5	0	0
Viceroy	3	2	0	4	1	0
Longred	0	5	0	0	2	3
John Baer	5	0	0	4	0	0
Moira	2	3	0	3	2	0
McMullen	5	0	0	0	4	1
Early Bird	1	3	0	1	4	0
Selandia	3	0	2	4	1	0
Roma	4	0	1	1	3	1
Burpee's Big Early	5	0	0	4	1	0
Hybrid Pink No. 12	5	0	0	4	0	1
Early Red Chief	1	4	0	2	3	0
Stokesdale	3	2	0	3	2	0
Veebrite	0	5	0	0	4	0
Super–standard Bonny Best	4	1	0	2	3	0
Hybrid Pink No. 6	2	3	0	3	2	0
Early Stokesdale No. 4	5	0	0	5	0	0
Early Detroit	4	1	0	3	2	0
Tomato Glamour	4	1	0	3	2	0
Manitoba	5	0	0	4	1	0
Dwarf Champion	1	3	0	2	1	1
Springset VF	0	4	1	5	0	0
Fantastic Hybrid	2	3	0	0	5	0
Cold Set	3	0	0	3	1	0
Beefeater Hybrid VFN	4	1	0	0	3	2
Hybrid Pink No. 1	3	2	0	2	3	1
Hybrid Pink No. 2	5	0	0	5	0	0

* Five seedlings used in each test.

** Infection level based on No. of resting spores/plant: L = 5 – 20; M = 20 – 100; H = > 100.

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