

Testing Variability in Pathogenicity of *Phytophthora cactorum*, *P. citrophthora* and *P. syringae* to Apple, Pear, Peach, Cherry and Plum Rootstocks

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The relative virulence of *Phytophthora cactorum* and *P. syringae* originating from almond trees, and of *P. citrophthora* originating from citrus, to apple, pear, peach, cherry and plum rootstocks, was studied *in vivo* and *in vitro*. Results of the different experiments were in good agreement. All tested *Phytophthora* isolates showed little virulence to pear rootstocks – causing only minor crown rot symptoms – and no virulence at all to apple rootstocks. In contrast, they were highly virulent to stone fruit rootstocks, causing crown rot disease. The non-pathogenicity of these isolates to pome rootstocks could be interpreted as strict host specificity.

KEY WORDS: Crown rot; pathogenicity; *Phytophthora*; pome fruit trees; stone fruit trees.

Phytophthora diseases are responsible for serious damage to fruit orchards in northern Greece. Many *Phytophthora* species are known to be the cause of apoplexy in fruit trees in Greece, including *P. cactorum*, *P. citrophthora*, *P. syringae* and *P. megasperma* (2,9,14). Also, both *P. cactorum* and *P. syringae* have been reported to cause *Phytophthora* diseases on apple trees (1,5). The goal of this study was to test the pathogenicity of *P. cactorum* and *P. syringae* recovered from almond trees and of *P. citrophthora* recovered from citrus to peach, cherry, plum, apple, and pear rootstocks. In every experiment, one isolate of each species was used.

One apple rootstock (MM106), six apple clones (Florina × TSR18t, Florina × Prima, Florina × J161, J161 × Jbusib, *Malus silvestrus*, Florina × TSR18t161), two pear clones (Queen × AKCE, AKCE × Queen), one cherry clone (Gizella), one peach clone (GF677) and one plum clone (S29) were used in this study. The excised twig assay was used in the laboratory experiment (7). A jar for each *Phytophthora*

species was used to inoculate ten segments for each rootstock. By subtracting the depth of agar from the total length of necrosis, the value for net necrosis length was obtained. A glasshouse experiment was conducted using the stem inoculation method (14). There were 18 pots for each rootstock and six pots for each *Phytophthora* species. Results were obtained by measuring the length of necrosis beneath the bark. Recovery of fungi was achieved on selective medium (8).

The experimental design used throughout the laboratory and glasshouse experiments was randomized. Data were analyzed by one-way analysis of variance and treatment means were separated by Duncan's Multiple Range Test ($P = 0.05$). Both experiments were conducted twice.

This work produced some evidence of variability in virulence within *Phytophthora* species. The results of different experiments were in good agreement. Apple rootstocks were not infected by any of the studied *Phytophthora* isolates, whereas all tested isolates were slightly virulent to pear rootstocks. In contrast with

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pome rootstocks, all the studied isolates appeared pathogenic to stone rootstocks. There were significant variations in quantity of colonized diseased tissue. *P. cactorum* and *P. citrophthora* were significantly more aggressive to Gizella compared with other tested stone rootstocks, whereas no difference was observed in net necrosis length between S29 and GF677 (Table 1). The development of canker was similar in all stone rootstocks inoculated with *P. syringae*. Fungi were isolated from at least two stone fruit trees with typical crown rot symptoms, but not from pome trees. It has been found that *P. cactorum*

isolates from birch were not detrimental to strawberry (11). Similarly, it has been suggested that *P. cactorum* infecting birch and strawberry are genetically and pathogenically separate (4). Also, isolates of *Phytophthora* from various host plants have been shown to have different pathogenicity (3,6,10,12,13).

Our results showed *P. cactorum*, *P. citrophthora* and *P. syringae* to be the cause of crown rot disease on peach, plum and cherry trees. Tested *Phytophthora* isolates exhibit differential virulence on stone and pome rootstocks, as opposed to strict host specificity.

TABLE 1. Canker development on excised twigs (*in vitro*) and on excised stems (*in vivo*) of GF677, S29, Gizella, Queen × AKCE and AKCE × Queen inoculated with *Phytophthora cactorum*, *P. citrophthora* and *P. syringae*

Rootstocks ^z	Mean lesion length ^x (cm)		
	<i>P. cactorum</i>	<i>P. citrophthora</i>	<i>P. syringae</i>
	Laboratory Experiment		
Gizella	2.18a ^y	1.81a	1.19a
S29	1.95b	1.76a	1.16a
GF 677	1.81b	1.23b	1.16a
	Glasshouse Experiment		
Gizella	1.82a	4.00a	0.92a
S29	1.06b	1.40b	1.28a
GF 677	1.20b	1.84b	1.12a
Queen × AKCE	0.36c	0.20c	0.44b
AKCE × Queen	0.34c	0.16c	0.34b

^z Apple rootstocks inoculated with tested *Phytophthora* species did not develop necrosis in either experiment. Pear rootstocks inoculated with tested isolates did not develop necrosis in the laboratory experiment.

^y Within columns, means followed by the same letter do not differ significantly ($P=0.05$) according to Duncan's Multiple Range Test.

^x Values are the means of two experiments, each with ten and six replicates in laboratory and glasshouse experiments, respectively.

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