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Short communication

Susceptibility of Gisela 5 and Maxma 14 cherry rootstocks to four *Phytophthora* species

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Abstract

Susceptibility of Gisela 5 and Maxma 14 cherry rootstocks to *Phytophthora cactorum*, *P. citrophthora*, *P. citricola* and *P. parasitica* was evaluated. All *Phytophthora* species were pathogenic to both of the cherry rootstocks tested. The level of susceptibility, however, varied according to *Phytophthora* species. *P. citrophthora* and *P. parasitica* isolates were the most virulent. *P. citricola* showed moderately virulence. The least virulence was shown from the *P. cactorum* isolates. Both rootstocks showed similar susceptibility.

Keywords: Cherry; Crown rot; *Phytophthora*; Rootstocks

1. Introduction

Gisela 5 and Maxma 14 cherry rootstocks are among the best dwarfing, precocious and productive rootstocks for modern, intensive sweet cherry growing (Zimmermann, 1994). In the last few years, Gisela 5 and Maxma 14 have replaced *Prunus avium* and Mazzard rootstocks in Greece because of their ability to produce dwarfing and precocity. These rootstocks show very good adaptation to Greek soil-climate conditions. Crown rot, caused by *Phytophthora* spp., is a serious disease of cherry trees (Erwin and Ribeiro, 1996). In Greece,*P. citrophthora*, *P. cactorum*, *P. citricola*, *P. parasitica* and *P. syringae* were

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reported as causal agents of crown rot diseases on cherry trees (Thomidis, 2001; Thomidis and Sotiropoulos, 2003).

The aim of this study was to evaluate the susceptibility of Gisela 5 and Maxma 14 cherry rootstocks to four *Phytophthora* species (*P. cactorum, P. citrophthora*, *P. citricola*, *P. parasitica*).

2. Materials and methods

Six isolates of *P. cactorum* (BPIC-1168, BPIC-1128, both isolated from the trunk of infected almond trees) *P. citrophthora* (BPIC-1262 isolated from the trunk of citrus, BPIC-1267 isolated from the trunk of a pear tree), *P. parasitica* (BPIC-1263 isolated from the trunk of citrus) and *P. citricola* (BPIC-1908 isolated from lemon fruit) were used in this study.

In an excised twig laboratory assay (Jeffers et al., 1981), cornmeal agar amended with antibiotics (primaricin 10 mg, ampicillin 250 mg, rifampicin 10 mg) was dispensed in sterilized jars to a depth of 10 mm. Two agar plugs with mycelium of a tested isolate were place into each jar. Jars were sealed and placed in incubators at 25 °C in the dark. Woody shoots, about 1 cm diameter and 7 cm long, were collected from 2-year-old mother trees. Using a flamed sharp knife, segments were trimmed to a slant at the base. Two jars for each *Phytophthora* isolate were used to inoculate 20 segments of each cherry rootstock. Jars were then resealed and returned to incubators for 4 days. By subtracting of the depth of agar from the total length of necrosis a value for necrosis was obtained. A second laboratory experiment was conducted using an excised shoot assay (Matheron and Mircetich, 1985). Segments of woody shoot of each rootstock, 6 cm in length and 1.5–2 cm in diameter were collected from the same mother trees. Thirty segments (10 from each of the three tested rootstocks) were inoculated with each isolate of *Phytophthora*. The inoculum, which consisted of a 6 mm in diameter plug from a 5-day-old culture, was inserted in the middle of excised shoot pieces under the bark. The wound was covered with petroleum jelly and wrapped with adhesive tape to prevent desiccation. Inoculated shoot segments were incubated for 4 days at 25 °C in moist chambers, after which the length of the resulting necrosis was recorded. A field experiment was conducted using a rootstock assay (Thomidis, 2001). Two-year-old trees were used in these experiments. Inoculations were performed on the trunk, about 10 cm above soil surface, by transferring an agar plug containing mycelium of the pathogen onto a wound. Each wound was then covered with petroleum jelly and wrapped with adhesive tape to prevent desiccation. Fifteen days later, the length of resulting necrosis was measured. Twenty plants (10 of each rootstock) were inoculated with each *Phytophthora* isolate. Temperatures during experiments ranged from 18 to 28 °C. P_5ARP selective medium was used for re-isolation of fungi (Jeffers and Martin, 1986).

3. Results and discussion

Results from both laboratory and field experiments are presented in Table 1. All isolates were pathogenic on Gisela 5 and Maxma 14 cherry rootstocks. In laboratory experiments, the isolates BPIC-1263 (*P. parasitica*), BPIC-1262 (*P. citrophthora*) and BPIC-1267 (*P.*

Table 1
Testing of the pathogenicity of four *Phytophthora* species isolated from various hosts on Gisela 5 and Maxma 14 cherry rootstocks in the laboratory and field

Isolates		Excised twigs		Excised stem		Stem inoculation	
		Gisela 5	Maxma 14	Gisela 5	Maxma 14	Gisela 5	Maxma 14
P. citrophthora[a]	BPIC-1262	37.25[b] a	35.16 a	33.25 a	30.15 a	61.98 a	57.99 ab
	BPIC-1267	37.33 a	36.43 a	34.37 a	33.55 a	62.55 a	59.16 ab
P. cactorum	BPIC-1168	31.27 b	30.11 b	18.59 b	20.31 b	45.4 c	43.21 c
	BPIC-1128	32.16 b	30.14 b	17.75 b	18.98 b	45.61 c	44.67 c
P. citricola	BPIC-1908	30.97 b	31.56 b	16.93 b	19.24 b	55.85 b	54.24 b
P. parasitica	BPIC-1263	36.85 a	32.71 ab	29.48 a	29.55 a	58.39 ab	60.07 a

Segments and plants inoculated with cornmeal agar without mycelium did not develop any necrosis and are not presented in the table.

[a] These were the only Greek *Phytophthora* isolates of the studied species kept in the collection.

[b] Values are the means of two experiments; results were similar according to the Bartletts's test of homogeneity of variance, so data were combined. Values followed by the same letters are not significantly different according to Duncan multiple range test ($P < 0.05$).

citrophthora) were the most virulent. Significantly less virulent were the isolates BPIC-1128 (*P. cactorum*), BPIC-1168 (*P. cactorum*) and BPIC-1908 (*P. citricola*). In field experiments, again the isolates, BPIC-1262 (*P. citrophthora*), BPIC-1267 (*P. citrophthora*) and BPIC-1263 (*P. parasitica*) were once again the most virulent. The isolate BPIC-1908 (*P. citricola*) was significantly less virulent than BPIC-1262 (*P. citrophthora*) and BPIC-1267 (*P. citrophthora*), but more than BPIC-1128 (*P. cactorum*) and BPIC-1168 (*P. cactorum*). The susceptibility of both Gisela 5 and Maxma 14 was similar.

Results in this study agree with those reported in previous work. Thomidis (2001) found that *P. citrophthora* and *P. cactorum* were pathogenic on cherry trees. Thomidis and Sotiropoulos (2003) also reported that *P. parasitic* and *P. citricola* can infect cherry trees. Both Gisela 5 and Maxma 14 cherry rootstocks were susceptible to *Phytophthora* and, therefore, caution must be taken when they are used in areas with a high pressure from these pathogens. Inoculation of stems, excised twigs and shoots can also be useful techniques for determining susceptibility to *Phytophthora* if relative and not absolute levels of disease are being evaluated. The mechanisms of resistance of different tissues to *Phytophthora* are poorly understood. Due to the different type of tissues affected and the response of different cherry species to infection, there is probably more than one resistance and/or tolerance mechanisms involved. Little is known about the mechanisms that controlling pathogenicity and virulence of different *Phytophthora* isolates on a specific plant. Therefore, we need to be cautious when characterising a scion or rootstock as resistant or susceptible because its behaviour may differ from species to species and from isolate to isolate.

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