

Seasonal Changes in Extent of Colonization of Citrus Root Tissue by Phytophthora citrophthora and P. parasitica

M. Matheron and J. Matejka

Abstract

For 24 consecutive months, root pieces were collected from field-grown Lisbon lemon trees established on Citrus aurantium (sour orange), C. jambhiri (rough lemon), and C. volkameriana rootstocks. Root segments were wounded, inoculated with Phytophthora citrophthora or P. parasitica, and incubated for 96 hr in moist chambers. Smaller lesions developed during Jan-Feb than during Jul-Oct on root pieces of all tested rootstocks inoculated with P. citrophthora as well as root pieces of C. aurantium inoculated with P. parasitica. Apparently there is a seasonal variation in the susceptibility of citrus rootstocks to colonization by Phytophthora. This information could be useful for more effective timing of fungicide applications.

Introduction

Phytophthora species have been reported to be the most important fungal pathogens of citrus. A high incidence of Phytophthora root rot, caused by P. citrophthora and P. parasitica, has been observed in Arizona. The goal of our overall citrus research program is to find "weak links" in the disease development cycle that we might exploit to enhance efforts to control Phytophthora root rot.

The focus of this research project is the host itself. Specifically, we want to know if citrus root tissue is uniformly susceptible to P. citrophthora and P. parasitica throughout the year.

Materials and Methods

Root segments 6-8 cm long and 5-10 mm in diameter were collected at monthly intervals for two years from Lisbon lemon trees established on Citrus aurantium (sour orange), C. jambhiri (rough lemon), and C. volkameriana rootstocks. Forty root segments were collected from trees on each of the three different rootstocks, washed in water to remove soil, then inoculated each month with either P. citrophthora or P. parasitica. Root segments were incubated for 96 hr in moist chambers, after which resulting lesions were measured.

Results and Discussion

Lesions that developed on excised root segments from the three different rootstocks inoculated with P. citrophthora were significantly smaller during Jan-Feb than during Jul-Oct (Table 1). Also, root pieces of C. aurantium inoculated with P. parasitica had smaller lesions during Jan-Feb than during Jul-Dec. These data suggest that there is a significant seasonal variation in susceptibility of citrus root tissue to colonization by P. citrophthora and P. parasitica.

Low susceptibility of citrus root tissue to Phytophthora was observed during Jan-Feb, which corresponds to the time of the year when citrus cultivars stop growing in subtropical climates. It is known that root growth usually ceases at soil temperatures below 10 C. This cessation of growth is most pronounced in the cooler winter climates experienced by citrus in Arizona and California. Growth and sporulation of Phytophthora also is highly restricted at the low soil temperatures prevalent during the winter months in Arizona and California.

Two fungicides, Aliette and Ridomil, are registered for use on citrus to control Phytophthora diseases. Results of this study suggest that fungicidal protection against Phytophthora is not as critical during the winter months as it is during times of the year when root susceptibility and temperature are conducive to development of Phytophthora root rot.

Table 1. Seasonal changes in lesion development on root segments from three citrus rootstocks inoculated with Phytophthora citrophthora or P. parasitica

Time period	Length of lesion (mm) resulting from inoculation of root segments of:		
	<u>c. aurantium</u>	<u>c. jambhiri</u>	<u>c. volkameriana</u>
Inoculated with <u>P. citrophthora</u>			
Jan-Feb	11.2 c	7.1 bc	7.4 c
Mar-Apr	14.9 c	6.0 c	9.1 bc
May-Jun	15.2 c	9.3 ab	11.2 b
Jul-Aug	23.7 b	10.0 a	10.9 b
Sep-Oct	20.8 b	10.7 a	16.4 a
Nov-Dec	28.7 a	9.2 ab	11.6 b
Inoculated with <u>P. parasitica</u>			
Jan-Feb	5.2 c	2.8 abc	3.5 a
Mar-Apr	8.2 bc	2.2 bc	4.4 a
May-Jun	6.4 bc	3.6 ab	3.9 a
Jul-Aug	13.4 a	2.7 abc	2.5 a
Sep-Oct	9.9 ab	1.8 c	3.6 a
Nov-Dec	12.9 a	3.7 a	3.6 a

*For each pathogen, numbers within each column followed by the same letter do not differ ($P = 0.05$) according to Duncan's multiple range test.