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Mycoflora of Roots of Texas Palm (Sabal mexicana) in Louisiana

C. A. HOLLIER AND S. C. DOUGHTY
Louisiana Cooperative Extension Service, Baton Rouge, LA 70803

Root rot has been reported as a problem of palms worldwide (Carpenter and Elmer 1978, Djerbi 1983, Joseph 1978, Joseph and Jayasankar 1982). Various fungi have been associated with serious damage to the root system expressed aboveground as decline, dieback or death of the entire plant (Carpenter and Elmer 1978, Joseph 1978, Joseph and Jayasankar 1982).

Several dozen Texas palms in New Orleans, Louisiana display symptoms of decline or dieback and root rots have been associated with these symptoms since the early 1980's. Attention was drawn to these palms because they either were leaning at angles other than vertical which is normal for the species or had completely fallen over. Damage caused by root rots is difficult to assess in the field.

Our objectives were to determine 1) the frequency of fungal invasion of roots of Texas palm and 2) the extent to which invaded tissues show disease symptoms.

Materials and Methods

Belowground parts of four asymptomatic and five symptomatic Texas palms were assayed for internally borne fungi. Roots were exposed, cut with a shovel and washed to remove loose soil. The cut plant roots were kept on ice en route to the laboratory, where they were cleaned by agitation in a mild detergent solution and rinsed under running tap water. Root sections were cut into about 1-cm pieces, and pieces were randomly selected for assay. Tissues assayed from each plant included 20 pieces of root replicated five times for a total of 100 pieces per root system.

After tissue pieces were examined for discoloration or necrosis, they were surface-sterilized in an aqueous solution of 0.5% NaOCl (Clorox) and 5% ethanol for 2 min, rinsed with distilled water, blotted dry on sterile tissue paper and placed on potato dextrose agar (PDA) amended with 30 mg/L each of chlortetracycline-HCl and streptomycin sulfate. Plates were incubated at 26° C for four days. Fungi were then counted directly or subcultured on PDA for identification.

Data pertaining to fungi isolated from symptomatic and asymptomatic plants were used to calculate relative frequency (RF) of invasion. RF was defined as the number of root pieces invaded per 20-piece sample.

Results

Roots of both symptomatic and asymptomatic plants rarely showed disease symptoms. From symptomatic plants 11% of the total number of root pieces assayed were discolored while those from asymptomatic plants numbered less than 3% although one or more fungi were isolated from over 75% of the root pieces regardless of source.

Rhizoctonia solani and *Fusarium* spp. were isolated most often from symptomatic plants with means of 19.4 and 4.6, respectively (Table 1). *Curvularia* spp., *Trichoderma* spp. and *Phoma* spp. were isolated less often with RF values of 2.1, 1.5 and 0.4, respectively.

Table 1. Relative frequency (RF) of isolation of fungi from roots of symptomatic and asymptomatic plants of S. mexicana *in New Orleans.*

Fungus	Symptomatic (RF means)#	Asymptomatic (RF means)#	Significance
Curvularia sp.	2.1 c	1.2 b	ns
Fusarium sp.	4.6 b	2.2 b	*
Phoma sp.	0.4 d	0.7 c	ns
Rhizoctonia solani	19.4 a	8.5 a	*
Trichoderma sp.	1.5 cd	9.5 a	*

RF = the number of root pieces invaded per 20-piece sample. Means in columns followed by the same letter do not differ according to LSD (P = 0.05).

* Indicates significant differences between means in a row ($P = 0.05$, ns = not significant).

From asymptomatic plants *Trichoderma* spp. and *R. solani* were isolated most often with RF values of 9.5 and 8.5, respectively. *Fusarium* spp., *Curvularia* spp. and *Phoma* spp. were found less frequently (Table 1).

When RF values of symptomatic versus asymptomatic plants were compared, symptomatic *R. solani*-infected root values were significantly greater than when compared to its presence on asymptomatic plants. The same was true for *Fusarium* spp., but the opposite was true for *Trichoderma* spp. (Table 1). The other fungi isolated did not differ in frequency regardless of source.

Discussion

The fungi isolated from the root systems of symptomatic and asymptomatic Texas palms were the same regardless of source. Root discoloration percentage varied slightly but the percent of root pieces from which one or more fungi were isolated was very high.

In symptomatic plants the RF of *Rhizoctonia solani* was significantly greater than for any other isolated fungus. It was found more than four times that of any other fungus. *R. solani* is a known root rotting organism of several species of plants (Agrios 1988). Its presence in such quantity may explain the slight increase in the observed root discoloration of the symptomatic plants and the presence of aboveground symptoms. Currently pathogenicity studies are underway to determine the role of *R. solani* in this process.

Trichoderma spp. was more prevalent from the roots of asymptomatic plants. It was evident that as *Trichoderma* spp. increased, the RF of *R. solani* decreased. *Trichoderma* spp. is a known antagonist to several fungi (Agrios 1988, Chet and Baker 1980) and probably explains the decrease in the presence of *R. solani*. The reduction in the presence of *R. solani* from the roots of asymptomatic plants further supports the theory that *R. solani* plays an important role in the deterioration of Texas palm root systems and subsequently leads to symptom expression.

Some fungi commonly isolated from palm roots, species of *Monacrosporium*, *Cylindrocarpon*, *Pythium* and *Penicillium* were noticeably missing in our study. These fungi might have been present but not detected because of competition from other microorganisms, incompatibility with Texas palm or unsuitability of the culture medium used for isolation.

Even though we observed relatively little root discoloration or necrosis indicative of disease, fungi, including reported root pathogens, were frequently found. Perhaps the presence of fungi in symptomless Texas palm root tissue is a more common phenomenon than previously believed. For symptomless but invaded roots to become diseased may require one or more stress factors or the natural weakening of senescence to trigger pathogenic activity by these fungi.

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