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Boxwood Phytophthora

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Boxwood-Phytophthora Root and Crown Rot

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Phytophthora root and crown rot is caused by several species of Oomycetes (known as water molds). The *Phytophthora* species are *P. cinnamomi*, *P. nicotianae, P. citrophthora* and *P. occultans*. American (common), Japanese and English boxwood species are susceptible to this disease.

The pathogen can infect all growth stages of field or container grown boxwood plants. Warm, humid and rainy conditions favor disease development. *Phytophthora* spp. can survive in soil or potting mix as resting spores (oospores, chlamydospores), or inside infected plant tissues as mycelium for long periods, and can infect other healthy boxwoods or other host plants. When the environmental conditions are favorable, chlamydospores and oospores produce new mycelium or sporangia. Sporangia release zoospores into soil, and the zoospores swim toward healthy roots through saturated soil or irrigation water.

Symptoms

The general symptoms include wilting, stunting, leaf shed, limb dieback, leaf chlorosis, off-color foliage, crown rot (gray to brown color) (Figure 1) and root rot (roots are brown and water-soaked). Depending on the disease progression in roots, foliar symptoms can be observed on a few branches or the entire plant (Figure 2).


Figure 1 and 2. Symptoms of boxwood Phytophthora crown and root rot.

Disease management

Phytophthora root and crown rot is stimulated by rising soil temperature and moisture, poor drainage, excessive irrigation, extended periods of heavy rainfall or when plants are planted too deeply. Management of Phytophthora requires an integrated approach. Scouting and early diagnosis along with sound cultural practices such as sanitation, good drainage, proper irrigation, irrigation water treatments, crop rotation and chemical control are effective control strategies. Sanitize tools, equipment and reused pots (or avoid reusing pots altogether). If the production area or field had Phyotophthora issues in the past, boxwood or other susceptible hosts should not be planted at least for three years.

Fungicides need to be applied before the establishment of the pathogen. A spray program that includes fungicides with different modes of action and FRAC codes is ideal for fungicide resistance management (Table 1).

If you would like to confirm that boxwood Phytophthora has infected your plants, you can submit a sample to your local university's plant diagnostic laboratory.

Table 1. List of selected fungicides and biorational products that can be used to prevent boxwood Phytophthora root and crown rot.

Fungicide	Active ingredient	FRAC code
Aliette WDG	Aluminum tris (O-ethyl phosphonate)	33
Alude	Mono and di-potassium salts of phosphorous acid	33
Adorn	Fluopicolide	43
Areca	Aluminum tris (O-ethyl phosphonate)	33
Banol	Propamocarb hydrochloride	28
Banrot	Etridiazole + thiophanate-methyl	1+14
Disarm O	Fluoxastrobin	11
Empress Intrinsic	Pyraclostrobin	11
Fosphite	Mono and di-potassium salts of phosphorous acid	33
Hurricane	Fludioxonil + mefenoxam	12 + 4
Mefenoxam 2 AQ	Mefenoxam	4
Micora	Mandipropamid	40
Orkestra	Fluxapyroxad + pyraclostrobin	7 + 11
Orvego	Ametoctradin + dimethomorph	45 + 40
OxiPhos	Mono and di-potassium salts of phosphorous acid + hydrogen peroxide	33
Pageant Intrinsic	Pyraclostrobin + boscalid	7 + 11
Root Shield	*Trichoderma harzianum* Rifai strain KRL-AG2	
RootShield *PLUS*+	*T. harzianum* strain T-22, and *T. virens* strain G-41	
Segovis	Oxathiapiprolin	U15
Segway O	Cyazofamid	21
Subdue GR	Mefenoxam	4
Subdue MAXX	Mefenoxam	4
Terrazole	Etridiazole	14
Truban	Etridiazole	14

NOTE: Before applying ANY disease management product, be sure to: 1) read the label to be sure that the product is allowed for the crop and the disease you intend to control; 2) read and understand the safety precautions and application restriction.

For additional information, contact your local nursery specialist office at:

Tennessee State University
College of Agriculture
3500 John A. Merritt Blvd., Box 9635 Nashville, TN 3720-1561
http://www.tnstate.edu/extension

Tennessee State University, Otis L. Floyd Nursery Research Center
472 Cadillac Lane McMinnville, TN 37110 http://www.tnstate.edu/agriculture/nrc/

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade, brand, or active ingredient names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar and suitable composition, nor does it guarantee or warrant the standard of the product. The author(s) and Tennessee State University assume no liability resulting from the use of these recommendations.

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