

Soil-borne pathogens

By Mary Ellen Salyan

Protect your plants from soil-borne pathogens you can't even see.

As Skagit County gardeners, we constantly contend with pathogens, living organisms that cause disease. Pathogens are parasitic; that is, they depend on a host to survive and reproduce. Soil-borne pathogens prefer to live within the soil, causing root disease. These creatures will not only harm a plant, they can even affect the soil itself.

Soil-borne pathogens are very difficult to observe with the naked eye. They are very small or microscopic in size and can not be adequately examined without the aid of magnification (greater than 10X). Soil-borne pathogens include fungi, bacteria and nematodes.

In order for disease to exist and thrive, the exact environmental conditions, in concert with a host and a pathogen, must be present simultaneously. Environmental factors are complex and numerous; a few include drainage, temperature, moisture, soil composition and pH, quantities of disease-suppressing organisms, and adjacent surroundings.

In order to maintain a healthy garden, frequently inspect your plants for disease. Above-ground visual symptoms of an ill plant may not be associated with root disease; therefore, is it wise to diagnose the entire plant, including the root system. For example, the yellowing of older leaves can be induced by the lack of nitrogen; these visual signs are similar to that of pathogen-induced leaf dieback, which generally starts on the tips of new growth. Pathogens, both soil and air borne, usually cause a uniform damage pattern; on the other hand, nonliving factors such as drought stress; nutrient deficiency; and animal, mechanical, chemical and weather damage display a random or scattered pattern.

Phytophthora, Rhizoctonia, Fusarium, Verticillium, and Armillaria are a few of the soil-borne pathogens that are prevalent in the Pacific Northwest. Excess moisture and soil pH are catalysts for these pathogens to thrive. Phytophthora causes late blight. Armillaria and Rhizoctonia cause root rot (honey mushrooms at the base of a tree is a visual symptom of Armillaria); Verticillium and Fusarium are known to cause wilt. Their life cycles vary, so it is important to note the weather, soil conditions, location and other obvious factors that would have direct impact on the ill plant, such as an open end of a drain pipe or heavy foot traffic.

As with any disease, prevention is generally more successful and beneficial than treatment. A two-pronged approach will make the environment supportive of healthy plant growth and the plants less susceptible to pathogens. Here are a few basic principles to help you control plant disease.

Prevent disease from developing on plants

- Choose the right location with good drainage and appropriate sunlight
- Select resistant plant cultivars and certified disease-free stock, then plant them at the right time of year
- Avoid wounds to plants
- When possible, obtain plants in their bareroot form; if this isn't possible, remove the potting soil from the root system (removing the unknown soil also gives you the opportunity to inspect the root system)
- Do not over-fertilize; doing so inhibits proper root development
- Management of soil pH—raising the soil pH 6.5–7 by using nitrate nitrogen in place of ammoniacal nitrogen, for example—will decrease the development of Fusarium Wilt

Eradicate soil-borne pathogens

- Crop rotation can be effective, but only if the alternate crop is not a host for the pathogen you wish to eradicate
- A thorough sanitation program should include keeping the ground free of all debris, such as leaves, rotted fruit, vines and limbs
- Prune out dead wood or canes
- Sulphur and copper products are allowed under organic growing guidelines
- If the soil is highly infested with these pathogens, removal of the soil is necessary; replace with disease free/garden soil (refer to Extension Bulletin EB1971E “Home Gardener’s Guide to Soils and Fertilizers” from your local WSU Extension Office)
- Remember: Pathogens can survive our mild winters

It is important to keep the plant healthy with good gardening practices, because a stressed plant is more susceptible to disease. Your local Master Gardener’s Plant Clinic will help you determine which soil-borne pathogen is responsible for any downturn in the health of your plants, while providing you with information that will help you maintain a healthy garden.

Stymied by your soil? Master Gardener Plant Clinics can help.

If your plants are performing poorly and you suspect a soil-borne pathogen, bring the plant to a Master Gardener Plant Clinic for a diagnosis and suggestions on how to address the problem. There are two clinics available during the growing season each year:

Burlington Clinic:

Open April – Oct., Wednesdays, 10 a.m. – 2 p.m.

Location: WSU/Skagit Co. Extension Office

11768 Westar Lane, Suite A

Burlington, WA 98233

360.428.4270, (dial “0” on clinic days; dial “228” to leave a message)

Anacortes Clinic:

Open April–Sept., Thursdays, 9 a.m. – noon

Location: Ace Hardware

1720 Q Avenue

Anacortes, WA 98221

360.293.3535

For more information on Master Gardener plant clinics, including how to collect and package your samples of plant diseases, insects or weeds, go to <http://www.skagit.wsu.edu/MG/clinics.htm>.



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REFERENCES:

- *Root Diseases and Soil-Borne Pathogens*; Toussun, Bega, and Nelson, ISBN# 0520015827
- *Soil-borne Plant Pathogens*; Philip Dickey, a ProIPM publication
- *Sustainable Gardening: The Oregon-Washington Master Gardener Handbook*, EM8742, October 2006
- *Sustainable Management of Soil-Borne Plant Disease*; ATTRA publication, National Sustainable Agriculture Information Service, www.attra.ncat.org
- *Fusarium Wilt*; Southwest Florida Research and Education Center