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Why Lavender Growers Should be Concerned about *Phytophthora* Root and Crown Rot Disease, and How to Avoid Infecting Your Crop

Lavender growers (farm owners and nurseries) should be concerned about *Phytophthora* because:

- It is routinely found on U.S. lavender farms.
- It is a killer of lavender plants.
- If not managed properly, it can ruin an entire field for years to come.
- Growers can incur significant financial losses due to this disease.
- The disease can be avoided by adopting proper management strategies.

In this article, we will review the properties of the genus *Phytophthora*, its history, spread, and effects on lavender, as well as how you can avoid introducing this disease on your farm. We will also discuss steps to take if you do find *Phytophthora* in your plants. In future articles, we will explore in more detail the "best management practices" for industry standards.

Phytophthora: the "Plant Destroyer"

Phytophthora is a fungal-like organism, often referred to as a water mold or oomycete that causes many diseases on economically important crops around the world. *Phytophthora* is said to be responsible for most of the root and crown rots of woody plants, in addition to fruit, stem, and leaf blights on various other crops [1]. *Phytophthora* species exist in nearly all soils and surface waterways at some level. There are over 100 species of this genus and many are known to be highly aggressive pathogens due to their ability to increase from low, often undetectable levels to high levels within a few days or weeks. This spread requires favorable environmental conditions, the most important of which is the presence of "free water", ie. one or more of the following: over-saturated soils, flooding and/or flowing water.

Phytophthora on Lavender: History and Spread

Phytophthora nicotianae (Pn) was first reported and described on U.S. lavender (*Lavandula angustifolia*) in 1991 [2] with widespread death of English Lavender plants at a Maryland nursery in 1987. Pn has a large host range, [3] and is found all over the world. Since 1987 there have been several studies reporting various *Phytophthora* species infecting lavender plants in North America and Europe. *Phytophthora nicotianae* is the most common species to be identified in these disease occurrences on lavender, but several other species, *P. palmivora*, *P. citrophthora*, *P. cinnamomi*, and one hybrid, P. x *pelgrandis* have been isolated from diseased lavender plants [4,5]. The ability of *Phytophthora* species to hybridize means the pathogen can adapt to environmental conditions, and potentially expand its host plant range, making it more of a threat.

Pn has recently been found to infect both *Lavandula angustifolia* and *Lavandula x intermedia* in the U.S. [4]. Once *Phytophthora* becomes established in soil, it is exceptionally difficult to eradicate. [3] Under the right conditions (usually saturated soils or flooding of some duration and warm temperatures), it quickly forms swimming zoospores that infect plant tissue. [3] Once the tissues are infected, the disease spreads within the plant, producing mycelium, swimming zoospores and resting spores. These disease propagules (mycelium and spores) can move via plants, and infected plant parts, soil, on tools, tractor

tires, shoes, in rainwater, irrigation water, and floodwaters. They can then spread to other areas of a farm or nursery, thus spreading the infection. Eradication can be costly and in some cases, impractical to overall farm management.

Recent Disease Spread in the U.S.

Since 2015 at least 11 lavender farms across the U.S. have been found to have *Phytophthora* root and crown rot on their lavender [4]. In some cases the disease may have arrived in plants purchased from plant nurseries. Some of these growers didn't discover they had the pathogen until their new lavender plants started to die in the field. In some cases the disease organism spread to the previously established lavender plants and contaminated the farm soil. As noted above the organism readily moves in rainfall, flooding or irrigation water. In a few cases, hundreds or even thousands of lavender plants had to be removed and destroyed.

How to Avoid Infection on Your Farm

Since these disease occurrences have been reported, the U.S. Lavender Growers Association (USLGA; see www.uslavender.org) has encouraged lavender growers to quarantine new plants, keeping them separate from their other plants, and to send tissue samples of any new lavender plants they receive to a testing lab to determine if they are infected with a disease before they plant. Growers may send their plant samples to their state plant diagnostic lab (usually located at their state's land grant university) or to Clemson University's Plant Problem Clinic: http://www.clemson.edu/public/regulatory/plant_industry/pest_nursery_programs/plant_prob_clinic/, which has agreed to be a testing location for lavender growers from across the country. Over the last two years, Dr. Steven Jeffers, a plant pathologist at Clemson, has been culturing and identifying the *Phytophthora* species isolated from the infected plants sent to Clemson. He has presented a webinar on *Phytophthora* that is available to watch in the member's education area of the USLGA website. The webinar describes how *Phytophthora* infects plants, how it spreads, and discusses how to treat it and how to avoid getting it in the first place, see: http://uslavender.org/2015/11/phytophthora-webinar/. Also available is one farmer's account of her experience with this pathogen, see: http://uslavender.org/2015/11?phytophthora-me/.

What to Do if Your Plants are Infected

If your plant samples test positive for *Phytophthora*, you should contact your state department of agriculture to determine if they have any protocols for dealing with diseased plants. The USLGA should also be notified by emailing education@uslavender.org so that our liaison may assist in any way possible.

If your state does not have specific handling requirements, and assuming the plants were quarantined, they should be placed in two layers of heavy plastic bags, including soil and pots, and buried, sent to the landfill or incinerated. The area where they were quarantined should be sanitized. If the plants were not quarantined, anything that was near the diseased plants may be contaminated and must be sanitized. Any nearby plants that may have had soil or water splashed on them from the diseased plants should be destroyed as described above.

If your field plants are tested and found positive for *Phytophthora*, the diseased plants and their nearest neighbors should be removed, including the soil around the root system. Keep in mind that the soil in the area may still contain the pathogen. You should treat the soil in that area as contaminated, taking care to not accidently spread the disease to other areas of your farm. Diseased plant material should be treated as described above (i.e., sanitized, buried or burned) to avoid infection of other plants and waterways. Continually monitor any remaining plants near the contaminated area for symptoms and remove them as soon as signs of the pathogen appear.

If plants were received from a nursery grower, the nursery should be contacted, informed of the situation, and given a copy of any report from a diagnostic lab. In some cases your state department of agriculture may advocate for you with the nursery. Discuss with your nursery the option of refunding your money if plants prove to be infected.

In order to gain the trust of the consumer, nurseries should provide a list of their "Best Management Practices" and any other proof of their responsible and proactive prevention practices to ensure that they are not producing and shipping diseased plants. Lavender growers would be wise to ask for assurances that all necessary measures are being taken at the nursery level to ensure that the plants they are ordering are disease free. Further, if the lavender grower intends to re-sell the plants, she/he bears responsibility as a retailer to provide healthy plants to the end user.

References:

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