Detection of *Phytopythium vexans* in New Jersey Conifer Nurseries

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Research Hypothesis: Numerous oomycete species, primarily Phytophthora spp., are causing root diseases in NJ conifer production at both ornamental nurseries and Christmas tree farms.

Introduction: The authors successfully obtained a USDA-SCBG grant focused on mapping the disease-causing oomycetes impacting conifer production in NJ. Oomycetes are some of the most globally important plant pathogens and regularly limit conifer and nursery stock production, sales, and management costs. Of particular importance was the regular isolation of *Phytopythium vexans,* which has not been previously reported to cause disease on these hosts.

Objective 1: Isolates oomycetes from root, soil, and water samples.
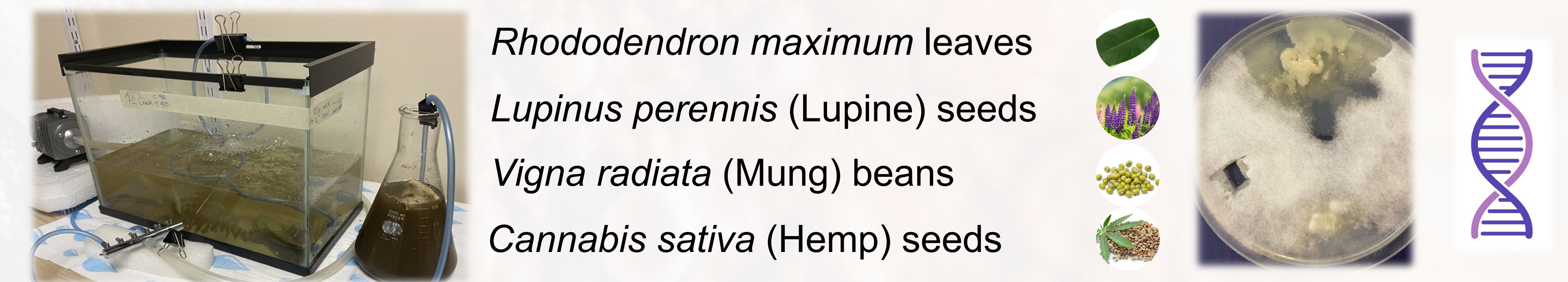**Objective 2:** Perform genetic sequencing on isolated oomycetes.
Objective 3: Compile a map of oomycetes detected on host crops.

Two isolation methods were utilized. To detect oomycetes infecting symptomatic crops, root samples were collected, surface sterilized in 70% EtOH, then plated on PARPH selective media (selects for Phytophthora, 'H' hymexazol selects against most Pythiums).
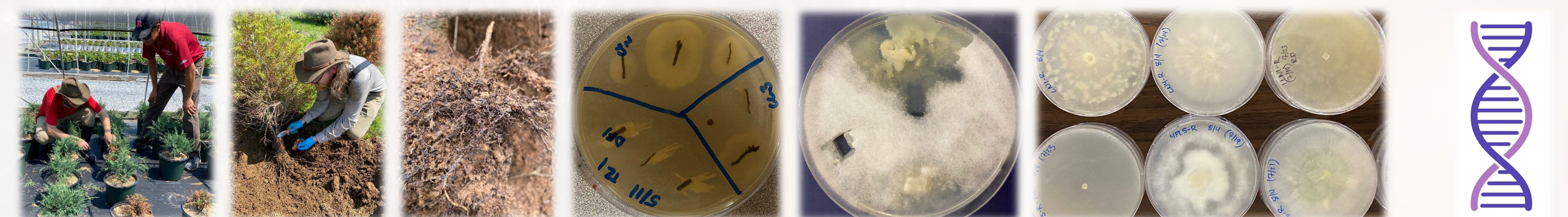
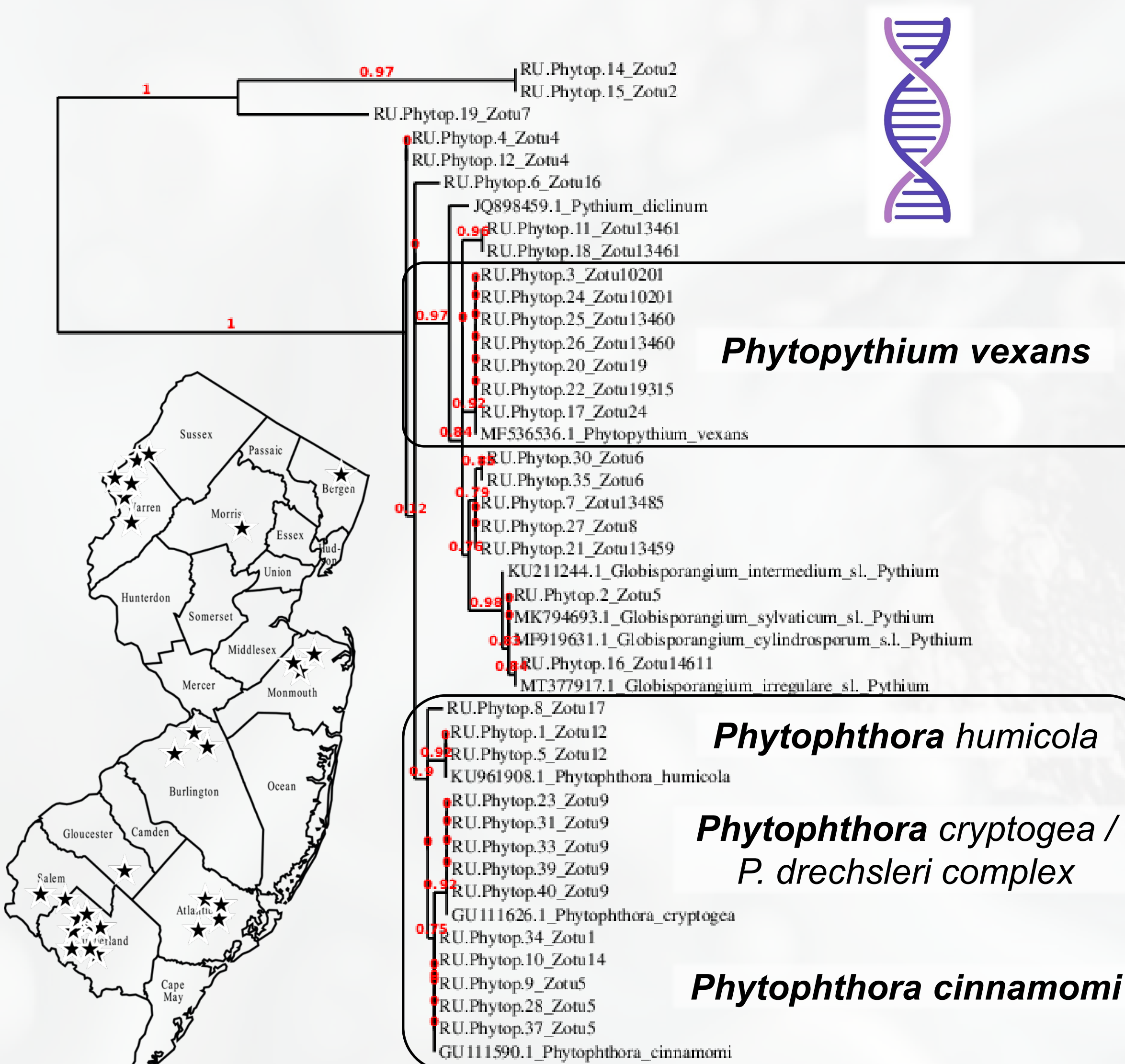Locate — Dig — Sample — Selective media (PARPH) isolations

Aerated growth tank — Oomycete 'Baits' — Selective media

Rhododendron maximum leaves
Lupinus perennis (Lupine) seeds
Vigna radiata (Mung) beans
Cannabis sativa (Hemp) seeds

To evaluate irrigation waterways, streams and soil, a novel off-site trapping/bait technique was utilized. Water samples were aerated and 'baits', in cheesecloth, were suspended in the tank for 96h. Baits were then surface sterilized and plated onto PARPH media prior to sequencing.

Phylogeny of NJ isolates collected from conifer nurseries and Christmas Tree Farms (ITS4,6)

Isolates also characterized via COX1, B-tubulin, and TigA gene loci. Internal transcriber spacer (ITS) shown for simplicity.

Phytopythium vexans

Phytophthora humicola

Phytophthora cryptogea / *P. drechsleri* complex

Phytophthora cinnamomi

As expected, numerous Phytophthora spp. were detected. **P. cinnamomi** is extremely destructive and has wide host range, whereas the other species are more host or environment specific. **Phytopythium vexans** was detected in a large proportion of samples, adding certainty to the occurrence of this pathogen in NJ. Many Pythium spp. were also isolated but will be discussed in other publications.

Occurrence of *Pp. vexans* and Phytophthora isolated from conifers and nursery stock

Host Crop	Oomycete	n =
Abies balsamea var. phanerolepis	*Phytopythium vexans*	6*
Pseudotsuga menziesii	*Pp. vexans*	2
Pachysandra terminalis	*Pp. vexans*	1
Abies concolor	*Pp. vexans*	1
Water - Natural waterways	*Pp. vexans*	3*
Rhodo. catawbiense	*Phytophthora cinnamomi*	3
Abies balsamea var. phanerolepis	*P. cinnamomi*	2
Abies concolor	*P. cinnamomi*	2
Ilex glabra	*P. cinnamomi*	2
Potentilla fruticose	*P. cinnamomi*	1
Chamaecyparis lawsoniana	*P. cinnamomi*	1
Microbiota decussata	*P. cinnamomi*	1
Picea abies	*P. cryptogea*	3
Pseudotsuga menziesii	*P. cryptogea*	2
Cytisus scoparius	*P. drechsleri*	1
Picea pungens	*P. humicola*	2

* *Abies balsamea* var. *phanerolepis* (Canaan fir) is thought to more resistant to Phytophthora and is often planted in NJ. *Pp. vexans* was isolated from natural waterways.

Moving forward: Oomycide and Root Exudate Bioassays

In-vitro **disk-diffusion** (direct toxicity of treatments) and **96-well bioassays** (root exudates + treatments) are being evaluated to better inform plant trials and recommendations.
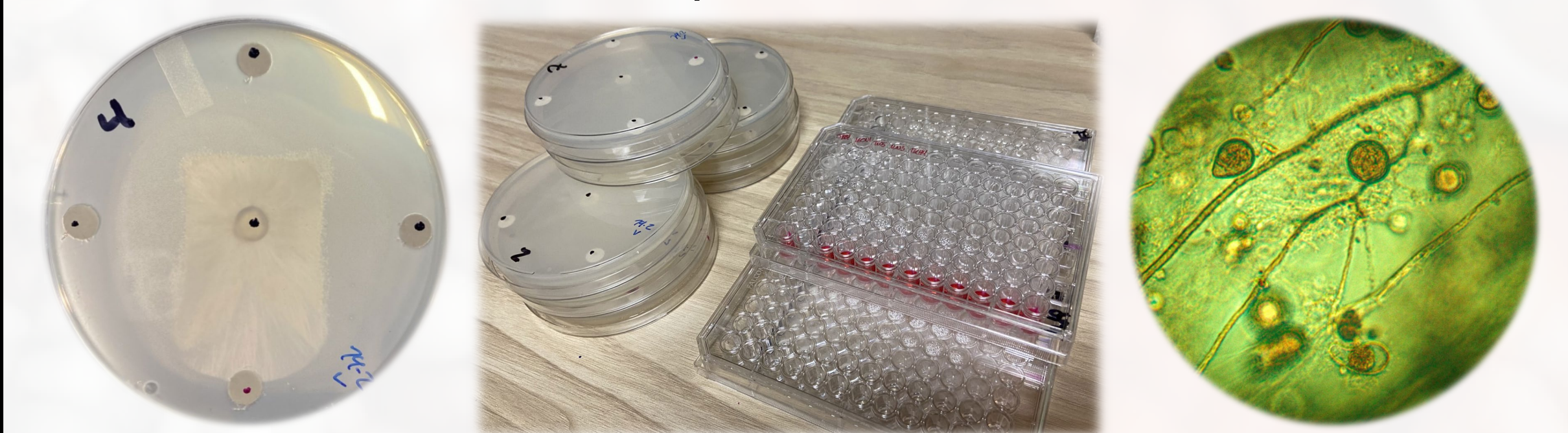
Moving forward: Plant trials & Koch's Postulates

Trials focused on pre-treatment then inoculation are currently underway. Given that *Pp. vexans* has not been reported on most hosts sampled, **Koch's Postulates** will be attempted.

This is important: 1. *Phytopythium vexans* was an unexpected detection in NJ crops, let alone at this high frequency. *Pp. vexans* has an enormous host range and could be a severe pathogen that has been going undetected (Ghimire & Baysal-Gurel, 2023). **2.** Many of the host detections may constitute First-Reports – pending completion of Koch's Postulates. **3.** Preliminary data (*not shown*) supports that *Pp. vexans* is much less responsive to many Phytophthora-targeting oomycides, meaning proper ID is likely critical to management efforts. **4.** This marks a huge leap forward in understanding the oomycete species impacting conifer nurseries in NJ.