Survival of *Phytophthora* species and other pathogens in soilless media components or soil and their eradication with aerated steam

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Phytophthora ramorum, thought to be largely a foliar pathogen on nursery crops, could be incorporated into container soilless potting media and thus become soilborne. Also, nursery containers from which infested media or infected plants were removed could be contaminated, as is true with other soilborne fungal pathogens. Inoculum from either source may initiate infections on subsequent crops grown in infested media or contaminated containers. Pathogens could be eradicated from soilless media by heat from steam, composting, or solarization; or by chemical fumigation. Growers currently attempt to decontaminate used containers by pressure washing and/or chemical sanitization. Many simply apply fungicides during the production cycle to prevent infections or to respond to occurrence of diseases.

Thus our objectives were to: (1) determine the capacity of *P. ramorum* (NA genotype isolate 2027, A2 mating type; and European genotype isolate D12A, A1 mating type), compared to *P. cactorum, P. citricola*, and *P. citrophthora*, to survive in potting media components [river sand, Douglas-fir (DF) bark, coir, sphagnum peat, redwood (RW) sawdust, a bark-peat-pumice potting mix (40:30:30 by volume), a dairy compost, and a garden soil] using inocula as sporangia (*P. ramorum* only), infected rhododendron leaf pieces containing chlamydospores or oospores, or chlamydospore or oospore inoculum produced in culture on vermiculite; and (2) determine the efficacy of heat from aerated steam mixtures to eradicate *P. ramorum* and other pathogens (as colonized vermiculite) from potting medium in containers. Survival of *Phytophthora* species was determined monthly by baiting (B) or direct plating (DP) on selective agar medium. For objective (2) we used heat from aerated steam mixtures to sanitize plastic containers filled with infested potting medium. Varied temperatures were established, from 45° C to 70° C for 30 min at 5° C increments, by changing the air/steam ratio. The pathogens used were *P. cinnamomi, P. ramorum, Pythium irregulare, Thielaviopsis basicola, Rhizoctonia solani,* and *Cylindrocladium scoparium*. Pathogen mortality was determined by DP or B.

P. ramorum was detected for 6 mo by B or DP from all substrates amended with sporangia or chlamydospores in vermiculite, but was not detected by either B or DF from infected leaf inoculum. *P. ramorum* sporangia survived best in peatmoss, potting mix, coir, and DF bark, and poorest in sand or soil. By comparison, *P. cactorum* was recovered after 5-6 mo from infected leaf inoculum in all media. *P. citricola* was recovered by B for only 3 mo in coir, potting mix, sand and soil, but not at all from compost, DF bark, peatmoss, or RW sawdust. *P. citrophthora*, as with *P. ramorum*, was never recovered from leaf inoculum in any material at any time. All pathogens were killed by aerated steam treatments of infested medium at 60º C or higher.

These results indicate (a) that *P. ramorum* can survive very well in potting mix components or soil as culture-produced sporangia or chlamydospores, but was not detected from infected leaf pieces compared to other *Phytophthora* species that were, and (b) that aerated steam pasteurization is an effective means of eradicating *P. ramorum* as well as other pathogens from infested media and contaminated containers without destroying the containers.