

Determining the Minimum Treatment Area and Importance of Soil Moisture for Effective Soil Solarization in Nurseries¹

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Abstract

Soil solarization is a low-cost, non-chemical method that can be highly effective in killing soilborne *Phytophthora* species in infested nurseries. This method consists of using a transparent plastic film to trap solar radiant heat. Understanding and implementing the best methods for soil solarization are critical for successful eradication of pathogens. We examined how the size of the solarization treatment area, soil moisture content, and duration of solarization affected the survival of *Phytophthora* inocula buried at 5, 15, and 30 cm.

Research sites were established in Corvallis, OR and at the National Ornamental Research Site at Dominican University of California (NORSUC) quarantine facility in San Rafael, CA in the summers of 2017 and 2018. At the California site, we tested survival of *P. ramorum*, and *P. pini*; at the Oregon site, we tested only *P. pini*. Each site contained 16 plots, arranged in a randomized block design with four blocks. Each block included three sizes of solarization treatment areas (0.25, 1.0, and 4.84 m²) and a non-solarized control. Half of the blocks were irrigated before solarization; the other half were not irrigated. Inoculum survival was determined after 2, 4, 6, and 12 weeks.

In 2017, each of the factors (species, depth, irrigation treatment, treatment area, and duration) significantly affected *Phytophthora* survival. Regardless of irrigation treatment, the greatest recovery of inoculum occurred in the non-solarized and 0.25 m² plots, and the lowest recovery occurred in the largest (4.84 m²) plots. At the 30 cm depth, *P. ramorum* was eliminated from both irrigated and non-irrigated treatments by two weeks in the 4.84 m² plots, whereas it persisted in 1 m² plots for up to six weeks. *P. pini* at the same depth in the 4.84 m² plots was eliminated by four weeks of solarization, but it took twelve weeks to kill it in the 1 m² plots. The smallest plots (0.25 m²) used for solarization were ineffective, with inoculum survival no different than in non-solarized soil. Similar trends were observed in 2018 trials. Effects of soil moisture on soil temperature and solarization effectiveness are still being investigated.

The impact of solarization in nurseries and restoration sites could be maximized and the associated costs reduced by optimizing treatment area, soil moisture content and duration of

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solarization. This research is critical for soil solarization to be an effective management tool in preventing the spread of soilborne *Phytophthora* species.