

What is the latest on the battle to control *Phytophthora ramorum* on ornamental nursery stock?

We have completed a two year evaluation of fungicides for the prevention and eradication of this pathogen. The fungicides were tested on four important ornamental nursery hosts: rhododendron, camellia, *Pieris* and *Viburnum*. First, we screened prospective fungicides by evaluating the preventative control of a wide range of commercially-available and experimental oomycete fungicides. Second, we selected the fungicides that provided the best efficacy in the fungicide screen and repeated these applications to determine their residual action to prevent infection. Efficacy was also judged by how well the pathogen was recovered from lesions resulting from infections. Finally, the eradication potential of these fungicides were judged by the success of recovery of the pathogen from lesions that were treated with these fungicides.

What fungicides are effective?

Cyazofamid, dimethomorph, mefenoxam, pyraclostrobin and fenamidone applied as foliar sprays consistently provided preventative control as expressed by reduced lesion size compared to water controls. These fungicides provided preventative activity for at least 4 weeks, except in rhododendron in which the tested fungicides were active up to 2 weeks following their application. When lesions occurred, the pathogen was successfully recovered from the lesions by isolation on selective media. Only cyazofamid and dimethomorph significantly reduced the success of isolation recovery.

Post-infection treatments of leaf lesions with foliar- and soil-applied fungicides were ineffective in reducing the size of lesions and the success of pathogen recovery from those lesions. The pathogen was recovered from lesions consistently for at least 6 weeks after fungicide application in rhododendron regardless of treatment. Fungicides will not be effective in eradicating existing infections and lesion development is not slowed significantly by fungicide application. Infected plants will need to be destroyed in quarantine situations. Laboratory isolation success declines with time after fungicide application and infection so agricultural inspectors should locate leaves that have recently formed lesions for isolation and most effective detection.

Lesion development can occur even with preventative fungicide application for various reasons: imperfect application uniformity, incomplete movement of fungicide, inherent fungicide efficacy, and weakened or wounded plants. If lesions occur, cyazofamid and dimethomorph could have a significant negative impact on isolation recovery.

What other factors should be considered when applying fungicides?

If applications of fungicides are made to nursery stock they should be made as preventative treatments. Currently, even the most active fungicides do not stop the

development of *P. ramorum* once foliar lesions are present. They need to be applied before environmental conditions favor pathogen infection, for example, before a period of rainy weather that would allow water to linger on leaf surfaces for many hours.

The regular and blanket use of fungicides will drive the mechanism that develops resistant pathogen strains. Fungicides with specific modes of action-- as many *Phytophthora*-active fungicides are-- will be especially vulnerable. Minimizing fungicide use, in any way, is the first priority to prevent resistant strains from developing. When fungicides are used, use different chemical classes- either in rotation or combining products in tank mixes. Fungicides active on *P. ramorum* may already be used in the nursery to control other foliar or soil-inhabiting *Phytophthora* species or related pathogens (such as downy mildews), and their use should be considered in planning the overall fungicide treatment strategy.

Fungicides active on *Phytophthora* should not be applied to high-risk nursery stock or cuttings that will be monitored for *P. ramorum* infection because detection of symptoms may be delayed or masked.