Grey mould control on container-grown Douglas-fir seedlings: Timing of fungicide application related to greenhouse environment – FRDA report 051

Grey mould, caused by the fungus *Botrytis cinerea*, is a serious impediment to the production of container-grown conifer seedlings in British Columbia. Current protectant spray programs are not entirely successful, increasingly resulting in yield-loss and promoting strains of *Botrytis cinerea* that show tolerance to fungicides.

As an alternative to the protectant programs, this research examines a post infective or curative spray program in which the fungicide is applied after conditions have been suitable for infection but prior to symptom development.

In this study Douglas-fir seedlings were grown in styrofoam blocks according to standard nursery practices in a polyethylene-covered greenhouse operated by Canadian Pacific Forest Products Ltd. at Saanich, British Columbia. Based on previous studies that identified the optimum environment for germination and infection by *Botrytis cinerea* on horticultural crops, the investigators monitored microclimatic conditions to determine a similar infection period (temperature 15-20°C with relative humidity (RH) > 98%, three hours duration or longer, and the presence of airborne *Botrytis cinerea* spores) considered for a grey mould epidemic to start. Following detection of an infection period, a schedule of fungicide spraying was implemented using three fungicides currently registered in British Columbia for control of grey mould on container-grown Douglas-fir seedlings: benomyl (Benlate 50W), chlorothalonil (Bravo 500 F), and captan (Captain 50WP). The fungicides were tested for efficacy in 13 experimental treatments as follows: one 4-level spray factor (benomyl, chlorothalonil, captan, control), one 3-level time factor (24, 36, or 48 hours) and one 2-level production spray factor. Seedlings were sampled for morphological effects of the treatments. Height and stem diameter were measured, but only minimal differences were found due to small variance within the sample. Data for efficacy and disease severity were examined separately and then ratings of each were added to produce a composite value of spray efficacy and disease severity.

Opportunities for a grey mould epidemic on container-grown Douglas-fir seedlings occurred readily throughout the growing season. Experimental results also showed that the time of applications was important to fungicide efficacy. However, none of the post infective spray times worked better than those timed to the production spray schedule. The 24-hour and 36-hour spray treatments were no more effective than the fixed schedule sprays – while the 48 hour treatment was not as effective. Research here suggests that latent infection occurs on senescent needles and then the pathogen spreads to healthy tissues as the season progresses.

As a corollary, although no better control was obtained from the 24 hour and 36 hour timed sprays compared to the production spray, the post infective sprays were no worse. The early 24 hour and 36 hour sprays following infection likely kill sufficient conidia prior to the establishment of a latent infection, to retard later secondary spread. Waiting 48 hours after an infection period before applying fungicide likely provides sufficient time for latent infection development on senescent needles.

Grey mould on sprayed seedlings was most severe on those treated with benomyl and this concurs with other research that showed isolates of *Botrytis cinerea* to be tolerant to benomyl. With primary grey mould infection on Douglas-fir seedlings occurring on senescent needles, the researchers have postulated that the mould may not be affected by the systemic action of Benlate.

Recommendations for a curative spray program include:

1) Prediction of grey mould infection periods requires accurate estimation of times with high RH and/or free water on leaf (needle) surfaces. The use of humidity data alone can be misleading at high RH’s where small temperature changes can result in undetected dew formation. Prior to the development of an accurate curative spray program for grey mould on Douglas-fir seedlings, a technique is needed to provide more precise measurements of leaf wetness duration.

2) With more accurate prediction of infection periods, control of grey mould in a post infection spray program could be achieved.
To reduce the chance of primary latent infection occurring, the contact fungicides captan or chlorothalonil would perform best in such a curative spray regime.

Copies of the 38 page report, *Grey Mould Control on Container-grown Douglas-fir Seedlings: Timing of Fungicide Application Related to Greenhouse Environment* by M. J. Peterson, J. R. Sutherland and R. N. Sturrock are available while supplies last, from:

Forestry Canada  
Pacific Forestry Centre  
506 West Burnside Road  
Victoria, B.C. V8Z 1M5

Please quote FRDA report No. 051 when ordering.