Western Nursery Pathology Workshop

Submitted by Diane Hildebrand

The 20th annual Nursery Pathology Workshop was held in conjunction with WIFDWC on Monday, September 10, 2001, from 12:30 pm to 5 pm. Approximately a dozen participants included state, federal, and industrial forest pathologists involved in forest tree nurseries, and other interested individuals.

For the WIFDWC proceedings this year, the Disease Control Committee requested a summary of the information shared by participants (attending or *in absentia*). The updated Nursery Pathology Mailing List was sent electronically to each participant who provided an e-mail address.

NEWS AND NOTES

Kasten Dumroese, PhD, formerly of University of Idaho, Moscow, is now working for the USDA Forest Service (USFS), Southern Research Station, as a Plant Physiologist in Jim Barnett's project. Kas is still stationed in Moscow, Idaho, and is the editor of the *Native Plants Journal*. Bob James and Kas are in the process of getting their paper, on their five-year study of hot water and copper treatments for containers, published in *HortScience*.

Tom Landis reports that two of the classic nursery pathology publication are now available on-line:
Forest Nursery Pests, USFS Agriculture Handbook 680, and *Growing Healthy Seedlings*, USFS and Oregon State University, August 1990. The on-line address is the website for Reforestation, Nurseries, and Genetic Resources: http://www.rngr.fs.fed.us/nurseries/publications.html.

Fifth meeting of **IUFRO Working Party S7.03.04, Diseases and Insects in Forest Nurseries**, will be held May 7-9, 2002 at the Kerala Forest Research Institute (FRI) in Kerala, India. The FRI has an impressive list of achievements and services related to natural resources. The website for the working party is http:iufro.boku.ac.at/iufro/iufronet/d7/hp70304.htm.

REPORTS

Cypress Canker on Port-Orford-Cedar
Katy Marshall, USFS, Southwest Oregon Forest Insect and Disease Service Center, Medford, OR

In November 2000, Cypress canker was identified on Port-Orford-cedar seedlings at the Dorena Genetic Resource Center in Cottage Grove, Oregon. This disease is caused by the fungus, *Seiridium cardinale*. Initial symptoms of the disease included dieback of branches and copious resin flow from sunken cankers on the boles. In many cases the infection court appears to have been at the point where small branchlets join the bole. Some of the cankers eventually became large and swollen, with broken bark. Mortality has occurred in some severely infected trees due to mechanical failure of the bole at the canker site.

The literature is unclear as to whether Port-Orford-cedar is a host in natural stands within its range. The disease is common on off-site Monterey cypress in California, in plantations of Leyland cypress grown for Christmas trees in the southeastern United States, on Port-Orford-cedar in New Zealand, and on several species of cypress in the Mediterranean. Right now it is not clear whether this disease is native to the area or was brought in on seedlings or cuttings,

possibly from California. All of the affected seedlings had been stored outside at Dorena during one winter. Later it was discovered that a group of seedlings previously brought from California and planted in outdoor raised beds were heavily infected, as were large natural incense cedars and one planted Leyland cypress on the lawn of the Center. On the Leyland cypress the fungus appears to be causing foliar infections, and producing many fruiting bodies. It may be a source of large amounts of inoculum.

All visibly infected seedlings in the greenhouses were destroyed in Fall 2000. Dorena personnel have been treating the remaining seedlings on an experimental basis with chlorothalonil to prevent infection based on research by McCain (1984, Journal of Arboriculture). They are planning to initiate additional trials this fall to test the efficacy of several other fungicides to control this disease.

Current Projects:

R.L. James, USFS, Northern Region, Forest Health Protection (FHP), Coeur d'Alene, Idaho

1. Alternatives to pre-plant soil fumigation at USFS Coeur d'Alene and Lucky Peak nurseries.
   a. Evaluate biological control formulations of *Trichoderma harzianum* as well as bio-fumigation using new varieties of *Brassica* spp. (in cooperation with the University of Idaho).
   b. Continue evaluating alternative chemical fumigants at the Lucky Peak Nursery (dazomet is the operational fumigant at Coeur d'Alene Nursery).
2. Refine sanitation treatments of reused styroblock containers in container nurseries (in cooperation with USFS. Missoula Technology & Development Center). Evaluate radio frequency waves and dry heat treatments.
3. Evaluate efficacy of commercially-available biological control treatments to control soilborne pathogens in container and bareroot forest nurseries.

Recent Publications:

R.L. James, USDA Forest Service, Northern Region FHP, Coeur d'Alene, Idaho

1. Dumroese, R.K., R.L. James and D.L. Wenny. 2000. An assessment of *Cylindrocarpon* on container western white pine seedlings after outplanting. West. J. of Appl. For. 15(1): 5-7.
2. James, R.L. 2000. Diseases associated with whitebark pine seedling production - Coeur d'Alene Nursery, Idaho. USFS, Northern Region, FHP Report 00-8. 11p.
3. James, R.L. 2000. Effects of a 2-year fallow period on soil populations of *Fusarium*, *Trichoderma* and *Pythium* species after incorporating corn plant residues - Coeur d'Alene Nursery, Idaho. USFS, Northern Region, FHP Report 00-17. 11p.
4. James, R.L. 2000. Effects of topical application of the biological control agent Biotrek® on production of bareroot Douglas-fir and western white pine seedlings - Coeur d'Alene Nursery, Idaho. USFS, Northern Region, FHP Report 00-5. 8p.
5. James, R.L. 2000. Root diseases of bareroot western larch seedlings - Coeur d'Alene Nursery, Idaho. USFS, Northern Region, FHP, Nursery Disease Notes No. 141. 9p.
6. James, R.L. 2001. Fungal distribution within plastic super cell®containers - Lucky Peak Nursery, Boise, Idaho. USFS, Northern Region, FHP, Nursery Disease Notes No. 145. 7p.
7. James, R.L. 2001. Outbreak of *Sirococcus strobilinus* on 2-0 ponderosa and lodgepole pine seedlings - Coeur d'Alene Nursery, Idaho. USFS, Northern Region. FHP, Nursery Disease Notes No. 142. 7p.
8. James, R.L. 2001. Phytophthora blight of container-grown *Ceanothus* seedlings at Coeur d'Alene Nursery, Idaho. USFS, Northern Region, FHP, Nursery Disease Notes No. 143. 10p.
9. James, R.L. 2001. Root disease of 1-0 bareroot Douglas-fir seedlings - Lucky Peak Nursery, Boise, Idaho. USFS, Northern Region, FHP, Nursery Disease Notes No. 144. 10p.

10. James, R.L. and K. Beall. 2000. Effects of fallowing on *Fusarium*-associated root diseases and production of bare root ponderosa pine seedlings at Lucky Peak Nursery, Boise, Idaho. USFS Northern Region, FHP Report 00-3. 13p.

IR4 Fungicide Testing For Botrtyis Control, Preliminary Results.

Will Littke and **John Browning**, Weyerhaeuser Forestry R&D, Centralia, WA.
Bob Lindermann, USDA Agricultural Research Service (ARS), Corvallis. OR
Robert Lambe, Hood's Canal Nursery, Port Gamble, WA.

IR-4 considers minor use testing and clearance for new pesticides. Many of the long term fungicides currently being used show reduced efficacy against established Botrytis strains. New novel fungicide/biocontrol agents are coming on the market to replace those agents that are being removed or have lost their efficacy.

A series of in-vitro growth inhibition test have been completed prior to this falls screening in the greenhouse. Isolates of *Botrytis cinerea* were collected from diseased seedlings, root isolation, seed, and from storage problems at several nurseries : (WA) Hoods Canal, Rochester, Mima, (OR) Turner, and Aurora. Isolates were grown on PDA agar (control) or fungicide amended PDA media at 25C. Measurements of colony diameter growth inhibition were made after 2-weeks.

Variation in fungicide tolerance was found amongst the isolates taken from several conifer container nurseries: This reinforces the need to have a rotation of fungicides with different modes of action. A new fungicide: Compass did not severely inhibit growth of the Botrytis isolates. A further fungicide concentration series (200 ppm, 600 ppm, and 1200 ppm A.I.) was prepared on several additional chemicals:

Trifloxystrobin- Compass 50W (Bayer)
Rapsody BioFungicide- Bacillus subtilis (AgraQuest)
Fenhexamid- Decree 50WDG (Sepro Corp)
Cyprodinil+Fludioxonil - Switch (Syngenta)
BASF 516

The preliminary results suggest some viable candidates (BASF-516, Switch, and Decree) to replace the fungicides with resistance buildup, however Compass and Rapsody do not appear to be effective or have problems with uniformity of action. Green house testing (Lambe) to take place in a Botrytis augmented environment (spores to be added from the isolates taken from the previous crop) followed by application of various chemicals at 1X, 2X and 4X recommended rates. Phytotoxicity is being investigated by Lindermann at ARS. Caution should be taken in the interpretation of results from media amended fungicide trials, since pathogen response to foliar applications might be different.

Alternatives to Methyl Bromide Soil Fumigation.

Will Littke and **John Browning**, Weyerhaeuser Forestry R&D, Centralia, WA.

Efforts continue on testing of various soil chemical fumigant treatments as alternatives to MB. Some of these new trials include evaluation of dramatic reductions in the concentration of MB from 67:33 (Chloropicrin) or 98: 2 (Chloropicrin) to 50:50 or 45:55 (Chloropicrin), or substitution of MB for straight 100% Chloropicrin, Telone 75: 25 (Chloropicrin), or combinations of Chloropicrin, Telone, and Metam-Sodium (TriFume 35).

Previously, we completed several multiyear (3-crop years') field validation trials using Chloropicrin, Telone/Chloropicrin, and Metam-Sodium as substitutes for MB in several Southern nurseries in Oklahoma, Arkansas, North Carolina and South Carolina. These results suggest that Chloropicrin at 200 lbs/ac could produce similar disease control efficacy as MB against Fusarium and Pythium. However, this fumigant does not control weeds as well and is overall not effective

against nut-sedge grasses. Mixtures of Telone (a nematicide) and Chloropicrin show promise as well as a good overall soil fumigant. Metam-Sodium has always tested slightly lower in efficacy and reliability to the other alternative fumigants.

In 2001, trials are underway at Magnolia, AR and Washington, NC to evaluate Chloropicrin and Telone/Chloropicrin for soil disease control, but also to further evaluate their weed control potentials. Fall 2000 post-fumigation samples showed nearly 100% removal of Fusarium soil propagules (0-12 inch depth) in all replicate treatments of MBC (98:2), Chloropicrin (100%), and Telone/Chloropicrin (75:25). Seedling root isolations taken in July show little Fusarium root infection between treatments or nurseries. Additional post-season pathology and morphology samples will be taken at lift (Jan 2002).

Mima nursery in Washington, is currently testing 50:50 MBC in seedbed 1-DO Douglas-fir against the current standard of 67:33 MBC. Results so far show no statistical difference in disease control, seedling density, or quality. A study of MBC (67:33), Chloropicrin (100%), and Telone/Chloropicrin (75:25) is underway in 1+1 Douglas-fir transplant beds. Post fumigation soil sampling showed no difference in efficacy when these three fumigants were applied in the fall.

Evaluations for effective alternatives to methyl bromide need to consider secondary pathogens (Cylindrocarpon sp.) and other pathogens that might no be picked up on the standard assay tests for Fusarium or Pythium. Weed control may become the most important pest management problem in the post-MB era.

Cylindrocarpon didymum-A New Pathogen or Secondary Root Colonizer?

Will Littke and **John Browning**, Weyerhaeuser Forestry R&D, Centralia, WA.

In 2001, several plantation Douglas-fir bare-root reforestation problems erupted in WA and OR after a cold and droughty winter and spring. *Cylindrocarpon didymum* and potentially other *Cylindrocarpon* species were routinely isolated from failing seedlings, in levels that would lead some to believe could be pathogenic.

There has been a lot published on *Cylindrocarpon destructans* as a seedling pathogen, storage decline pathogen, and in causing plantation failures of container seedlings. Less has been reported about *C. didymum* and its ability as a pathogen.

Cylindrocarpon is routinely isolated from bare-root and container seedlings as a consequence of isolation of *Fusarium* species using Komada's media. In most instances *C. didymum* occurs in association with other nursery pathogens such as Fusarium and Pythium. It's ability to grow at lower temperatures (0-3C), tolerance of commonly applied fungicides (Ferbam, Daconil, Chipco 20619), and in adverse soil physical environments (flooded soils, compacted areas) increases the possibility that *C. didymum* may a be pathogen under specific circumstances.

Root fragments sieved from soils in a 1-year follow field were found to harbor *C. didymum* at levels of 0-50%, but could not be recovered from similar roots 1-month post MBC fumigation. Soil propagule counts of *C. didymum* are not reliable given competition by other fungi, however the suggestion of incubation of soil plates at lower temperature to selectively isolate this fungus have not yet been tested. Root fragments from lifting boxes used the previous crop season were also shown to be infected with this fungus. These findings indicate that *C. didymum* may be able to sustain itself and to re-infest soils and seedlings from previously infected materials. This fungus produces abundant chlamydospores when grown on PDA.

Isolates of *C. didymum* are currently being evaluated for their ability to cause root mortality on lifted 1+1 DF. Other tests are being conducted to evaluate fungicide or biological disease control options in bare-root and container crops. Thanks to Dr. Jeff Stone at Oregon State University for identification of *Cylindrocarpon didymum*.

Field B Demonstration, Comparison of Grass Cover Crops, Bare Fallow, and Dazomet Fumigation at J. Herbert Stone Nursery, 1997-1999.

Diane M. Hildebrand, USFS, Portland, OR, and **Jeffrey K. Stone**, Oregon State University

This demonstration compared the effects of grass cover crops, bare fallow, and fumigation, as pre-plant treatments, on density and size of conifer seedlings. As a demonstration, treatments were implemented in large blocks, without replication. Based on measurements of seedling density, diameter, and height, trends in the data suggested that for Douglas-fir, ponderosa pine, and lodgepole pine, the best treatment was bare fallow with dazomet. Trends also suggested that rye cover crop with dazomet was among the best treatments for Douglas-fir. Sudan cover crop with dazomet tended to be the best treatment for Shasta red fir. Disease pressure in Field B was fairly low, as usual for this Field.

Current Projects

Diane M. Hildebrand, USFS, Portland, OR

1. Alternatives to Fumigation trial, implemented in Field K at J. Herbert Stone Nursery, 1999-2001, in a randomized block design, with six Blocks, tests four pre-plant treatments for four conifer species. Treatments include grass cover crop with and without dazomet fumigation and bare fallow with and without dazomet fumigation. Because of soil characteristics, some disease pressure is expected, based on past experience with conifers in this field. With six replications, this field trial may provide useful data on the relationship of fungal pathogen population levels and disease in conifer seedlings at the nursery.
2. Alternatives to Fumigation trial, implemented in Field B at J. Herbert Stone Nursery, 2000-2002, in randomized blocks of bare fallow and dazomet fumigation. The blocks are split for comparison of four fertilizer treatments for Douglas-fir, incense cedar, noble fir, and ponderosa pine, and for comparison of soil amendments (medite and sawdust) for Douglas-fir, noble fir, and ponderosa pine. Medite is a by-product of a local wood-fiber industry and is readily available to the nursery.