SOIL POPULATIONS OF *FUSARIUM* AND *PYTHIUM* WITHIN BLOCK 35, FIELD 10, USDA FOREST SERVICE NURSERY, COEUR D'ALENE, IDAHO

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The southern portion of Field 10 at the USDA Forest Service Nursery, Coeur d'Alene, Idaho has recently been utilized for tree improvement plantings, including evaluation of transplanting performance of rooted cuttings and western white pine seedlings inoculated with blister rust. Section 35 of the field is at the southernmost edge and is bordered on the north with a white pine planting and on the south with a road that circles production areas. Growers want to use section 35 for tree improvement evaluations (rooted Douglas-fir cuttings) to be planted in the spring of 1990. This portion of Field 10 had not been fumigated for several years. Therefore, soil samples were collected and analyzed for presence of two groups of potential root pathogens of conifer seedlings: ***Fusarium*** and ***Pythium***.

Ten soil samples were collected along two east-west transects through section 35. Samples 1-5 were collected from the north portion of the section and samples 6-10 from the south portion. Samples were obtained about 20 ft. apart (directly adjacent to irrigation risers). A 1-inch diameter soil probe was used to collect samples to a depth of about 6 inches. Each sample consisted of five collections with the probe (a central core and four cores collected about 1 ft. from the central core in each of the four cardinal directions). Soil from each of the five cores was combined in a paper bag and thoroughly mixed. All bags were refrigerated en route to the laboratory for analysis.

Each soil sample was passed through an 8-mesh sieve to remove rocks and larger pieces of organic material. A small subsample of two soil samples were used to calculate oven-dry weights. For this determination, samples were dried at about 100°C for at least 24 hours (until the weight of the sample became stabilized). An oven-dry weight factor was calculated based on the amount of moisture that was lost from soil samples during drying. For analysis of fungal populations, field-moist soil was used, but propagules were reported on an oven-dry weight basis.

For assay of ***Fusarium*** spp., 0.5g of soil was weighed from each sample and combined with 100 ml of 0.3% water agar. The agar-soil solution was thoroughly mixed and 1 ml of this solution was placed on each of three plates of selective agar media (Komada 1975). The solution was spread uniformly over the agar surface using a sterilized glass rod. All plates were incubated at about 24-26°C under diurnal cycles of cool, fluorescent light for 5 days. Colonies of ***Fusarium*** were distinguishable after 5 days from other fungal colonies on the basis of colony morphology and pigment formation.

For assay of ***Pythium*** spp., 5.0g of soil was weighed from each sample and combined with 100 ml of 0.3% water agar. The agar-soil solution was thoroughly mixed and I ml of this solution pipetted onto each of three plates of selective agar media (V-8 juice agar amended with pimaricin and other antibiotics). The solution was spread uniformly over the agar surface and all plates were incubated at about 24°C in the dark for 3 days. Colonies of ***Pythium*** were distinguished by their morphology and growth rate. They were confirmed by microscopic examination of sporangia and oogonia.

Colony-forming units per gram of soil were calculated for each soil sample (Table 1). ***Fusarium*** propagules averaged slightly more than 1000/g of soil, although they ranged from a high of 2206 to 334. Higher levels occurred in the northern portion of section 35. For ***Pythium*** spp., average propagule levels were calculated at 275 with slightly higher levels in the northern portion of section 35.

Assay procedures used in this evaluation did not distinguish pathogenic propagules of either ***Fusarium*** or ***Pythium*** from saprophytic types. Therefore, it is difficult to predict amount of disease that would likely result from certain levels of these fungi detected in soil. However, past experience indicates that ***Fusarium*** levels exceeding 1000/g and ***Pythium*** levels above 100/g should be considered sufficient to cause some concern from growers. Efforts should probably be taken to reduce populations below these threshold levels before planting stock in fields. Since average levels in

section 35 exceeded these threshold levels, it is probably wise to treat this section prior to transplanting tree improvement stock into the field. Soil fumigation with dazomet effectively reduces levels of ***Fusarium*** and ***Pythium*** (Campbell and Kelpsas 1988), but problems of toxicity to nearby western white pine seedlings has occurred at the nursery. Since white pine seedlings border the area to be treated, fumigation with dazomet is not recommended. However, treatment with fungicides prior to and after planting may be another alternative to reduce fungal populations to innocuous levels. Therefore, growers plan to treat section 35 with benomyl and metalaxyl to try to reduce levels of ***Fusarium*** and ***Pythium***, respectively. Treatments will be made prior to transplanting Douglas-fir rooted cuttings and additional treatments after planting may be required. Subsequent treatments will be based on current populations of potential pathogens which will be monitored following initial fungicide applications.

Table 1. Populations of ***Fusarium*** and ***Pythium*** within soil in block 35, field 10 USDA Forest Service Nursery, Coeur d'Alene, Idaho.

Sample Number[1]

	1	2	3	4	5	6	7	8	9	10	Ave.
Fusarium											
Ave. Col/Pl[2]	11.0	5.0	3.3	8.0	9.7	2.0	3.7	3.3	1.7	2.7	5.0
CFU/g[3]	2206	1003	669	1605	1939	401	735	668	334	535	1009
Pythium											
Ave. Col/Pl[2]	14.7	16.0	13.3	14.0	12.3	21.0	11.7	15.0	9.3	10.0	12.7
CFU/g[3]	295	321	267	281	247	421	234	301	187	200	275

[1] Samples 1-5 were collected from the north portion of section 35 (adjacent to current white pine planting) and samples 6-10 were located in the southern portion of section 35 (adjacent to road surrounding production fields).

[2] Average number of ***Fusarium*** or ***Pythium*** colonies per petrie plate (composite of three plates).

[3] Colony-forming-units of ***Fusarium*** or ***Pythium*** per gram of soil.

LITERATURE CITED

Campbell, S. J. and B. R. Kelpsas. 1988. Comparisons of three soil fumigants in a bareroot conifer nursery. Tree Planters' Notes 39(4):16-22.

Komada, H. 1975. Development of a selective medium for quantitative isolation of ***Fusarium oxysporum*** from natural soil. Rev. Plant Prot. Res. :114-125.