NURSERY DISEASE NOTES USDA FOREST SERVICE

NORTHERN REGION
FOREST HEALTH PROTECTION

No. 139 April 1998

RECOVERY OF 2-0 WESTERN LARCH FROM SEVERE MERIA NEEDLECAST- USDA FOREST SERVICE NURSERY, COEUR D'ALENE, IDAHO

R.L. JAMES
Plant Pathologist*

ABSTRACT

Bareroot 2-0 western larch seedlings were severely infected by *Meria laricis* in late May 1996 and nearly completely recovered from the disease by the end of August. New foliar growth that remained uninfected occurred when warmer and drier weather prevailed throughout most of the summer. Fungicide applications also helped prevent infection of new foliar growth by *M. laricis*. High levels of disease in the spring does not necessarily result in substandard seedlings and excessive cull rates by the time seedlings are lifted in the fall. Weather seems to be the most important controlling factor affecting ability of diseased seedlings to recover.

INTRODUCTION

Western larch (*Larix occidentalis* Nutt.) is an important conifer species for reforestation on lands in the inland Pacific Northwest. Large numbers of both container and bareroot western larch seedlings are traditionally produced at the USDA Forest Service Nursery in Coeur d'Alene, Idaho. Bareroot seedlings are grown in a two year crop cycle at the nursery. An important disease affecting larch seedlings primarily in their second growing season is Meria needlecast, caused by *Meria laricis* Vuill. (teleomorphs: *Rhabdocline* spp.)(Gernandt et al. 1997). This fungus, which is a native pathogen in nearby forests, attacks foliage and succulent twigs, turning foliage orange-red (figure 1). *Meria laricis* normally attacks larch foliage in the early spring when cool, wet weather prevails (Cooley 1984; Dubreuil 1982; James 1985). Because this disease has recurred at different times in the recent past at the Coeur d'Alene Nursery (James 1985, 1991), growers have instituted a program of chlorothalonil applications as a prevention to disease buildup. In most years, fungicide applications keep disease levels low so that few seedlings are damaged. However, sometimes when cool, wet weather prevails into early summer, disease may occur at high levels despite fungicide applications (Cooley 1981; James 1991). Such was the case during the spring of 1996. By the end of May, 2-0 western larch was severely

* Stationed in Coeur d'Alene, Idaho

damaged by Meria needlecast (figure 1), even though seedlings had been sprayed with fungicide several times. Rain was so frequent during the spring that foliage never really dried out and fungicides were frequently washed off foliage shortly after application.

Meria needlecast is a recurring disease that seldom causes seedling mortality but can affect growth and subsequent amount of culling following lifting (James 1990; James et al. 1995). An evaluation was conducted to determine how the 1996 2-0 bareroot western larch crop would respond to high spring levels of disease and if severe disease would affect seedling quality by the time of fall lifting.

MATERIALS AND METHODS

In early May, 1996 several samples of diseased seedlings were analyzed for presence of *M. laricis* on infected foliage. Normally the fungus sporulates through stomata located in rows on the under surface of needles (Gernandt et al. 1997; James 1985). Erumpent sporodochia can be seen by staining infected needles with cotton blue and examining the stomates under a binocular microscope (10-70X). The peanut-shaped spores (Cooley 1984; Gernandt et al. 1997) can be dislodged by aggitating needles in either water or cotton blue and examining them under the compound microscope (200-300X). All the samples examined in early May were consistently infected with *M. laricis* and abundant inoculum was produced on infected needles.

Near the end of May several photo plots were established within severely-infected fields. Five different plots, delineated with large orange plastic stakes, were located throughout diseased fields. Photos of each plot were taken at 3 week intervals throughout the 1996 growing season to compare changes in disease severity as manifested by seedling foliage color. Periodic foliage samples were also collected to confirm continued presence and sporulation of *M. laricis*.

RESULTS AND DISCUSSION

In late May most seedlings appeared bright orange with little evidence of green foliage (figure 1). Western larch could very easily be separated from other conifer species by its orange color contrasted with normal green. By the end of July, many diseased seedlings had grown healthy green foliage (figure 2), giving fields an overall green color in the upper seedling canopy and orange in the lower canopy. At this time, foliage samples still yielded presence of *M. laricis* inoculum, but not at the high levels found in May.

By the end of August, diseased western larch appeared mostly green (figure 3). Close examination revealed some foliar necrosis caused by *M. laricis*, but it was restricted to lower portions of seedling crowns (figure 4). Necrotic foliage collected at this time did not yield presence of sporulating *M. laricis*.

During 1996, western larch seedlings severely infected with *M. laricis* nearly fully recovered and appeared healthy after 3 months (between late May and late August). After warm, dry conditions followed wet spring weather, seedlings began recovering primarily by initiating new top growth. At the same time, infected foliage was cast from the bottoms of diseased seedlings. Environmental conditions were not conducive to recurring infection after normal summer conditions occurred. Therefore, newly formed foliage was usually not infected. Also, chlorothalonil applications were continued until dry weather occurred in the summer.

Experience over several years has indicated that *M. laricis* relies heavily on presence and prolongation of cool, wet weather for infection and disease buildup (Cooley 1981; Dubreuil 1982; James 1985, 1990, 1991). If normal drying does not occur during the summer, this pathogen can continue to cause infection and initiate seedling mortality (James 1985, 1990), resulting in substandard seedlings, high cull rates, and poor outplanting performance (White 1985)

Figure 1. Bareroot 2-0 western larch seedlings severely infected with *Meria laricis* at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. Photo was taken at the end of May, 1996.

Figure 2. Photo plot of 2-0 bareroot western larch seedlings severely infected with *Meria laricis* at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. Photo was taken at the end of July, 1996 after new foliage growth had started.

Figure 3. Bareroot 2-0 western larch seedlings which had been severely infected with *Meria laricis* in the spring at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. Photo taken at the end of August, 1996 after healthy, green foliage had regrown on diseased seedlings.

Figure 4. Photo plot of bareroot 2-0 western larch seedlings which had been severely infected with *Meria laricis* in the spring at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. Photo taken at the end of August, 1996 after healthy, green foliage had regrown on diseased seedlings.

However, as was seen during 1996, high levels of disease in the spring does not necessarily result in high losses by the time of fall lifting. If new flushes of growth can be protected from infection by relatively dry weather and fungicide applications, most diseased seedlings will fully recover. The most important controlling factor in potential recovery is the weather. The disease seems mostly weather-dependent and as such, different levels of disease from year to year will be difficult to predict.

It is recommended that growers continue to apply protective fungicides during the spring starting when needles are fully formed and continuing until relatively dry conditions occur in early summer. More chemical applications will be required in some years than in others. Fungicide applications should be governed by presence of noticeable disease, particularly at the base of seedlings, and occurrence of cool, wet weather. Currently, the only fungicide used for this disease at the Coeur d'Alene Nursery is chlorothalonil. Although this fungicide is usually efficaceous (Cooley 1981; James 1990), it is important that resistance to chlorothalonil not be allowed to build up in pathogen populations. The best way to prevent this is by applying other fungicides, particularly those with different mechanisms of action (Dekker 1976; Delp 1980; Gillman and James 1980). Other chemicals that might be efficaceous against *M. laricis* include triadimefon, iprodione, vinclozolin, and thiophanate methyl (Cleary 3336^{R})(Thomson 1997).

LITERATURE CITED

Cooley, S.J. 1981. *Meria laricis*: fungicide control and outplanting survival. USDA Forest Service, Pacific Northwest Region, Forest Pest Management. 18p.

Cooley, S.J. 1984. *Merial laricis* on nursery seedlings of western larch in Washington. Plant Disease 68:826.

Dekker, J. 1976. Acquired resistance to fungicides. Annual Review of Phytopathology 14:405-428.

Delp, C.J. 1980. Coping with resistance to plant disease control agents. Plant Disease 64:652-657.

Dubreuil. S.H. 1982. Western larch needle blight and needle cast. USDA Forest Service, Northern Region, Forest Pest Management. Report 82-9. 14p.

Gernandt, D.S., F.J. Camacho and J.K. Stone. 1997. *Meria laricis*, and anamorph of *Rhabdocline*. Mycologia 89:735-744.

Gillman, L.S. and R.L. James. 1980. Fungicide tolerance of *Botrytis* within Colorado greenhouses. Tree Planters' Notes 31(1):25-28.

James, R.L. 1985. Meria needlecast of western larch seedlings at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region, Forest Pest Management. Report 85-20. 6p.

James, R.L. 1990. Larch needle cast. *In*: Hamm, P.B., S.J. Campbell and E.M. Hansen (eds.). Growing Healthy Seedlings: Identification and Management of Pests in Northwest Forest Nurseries. Forest Research Laboratory, Oregon State University. Special Publication No. 19. p.33.

James, R.L. 1991. Meria needle cast on bareroot 2-0 seedlings and young tree improvement plantation trees - USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region, Forest Pest Management. Nursery Disease Notes No. 118. 3p.

James, R.L., R.K. Dumroese and D.L. Wenny. 1995. Management of fungal diseases of western larch seed and seedlings. *In*: Schmidt, W.C. and K.J. McDonald (compilers). Ecology and Management of *Larix* Forests: A Look Ahead. Proceedings of an Internation Symposium. USDA Forest Service, Intermountain Research Station. General Technical Report GTR-INT-319. pp. 300-306.

Thomson, W.T. 1997. Agricultural chemicals. Book IV - Fungicides (12th Edition). Thomson Publications, Fresno, CA. 236p.

White K.N. 1985. Field survival and growth of 1-0 & 2-0 western larch seedlings infected with *Meria laricis*. Unpublished report, Colville Ranger District, Colville National Forest. 20p.