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Variation in cedar leaf blight (*Didymascella thujina*) resistance of western redcedar (*Thuja plicata*)

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Abstract: Western redcedar *(Thuja plicata* Donn ex D. Don) seedlings from a population study with family structure were planted at four sites across coastal British Columbia. All seedlings at the time of planting were infected with cedar leaf blight (CLB) *(Didymascella thujina* (E.J. Durand) Maire). CLB severity and tree heights were measured at various ages from 2 to 12 years. There were significant site differences in CLB severity with the coastal hypermaritime site showing the most and with the submaritime site showing the least. Population differences in disease severity were evident with British Columbia coastal, low-elevation populations exhibiting the most resistance and with British Columbia high-elevation and California sources showing the least. Population resistance was consistent across all four sites (all $r > 0.90$, $p < 0.001$). Coefficients of additive genetic variation in CLB severity at all four sites varied from 13.2% to 20.1% with narrow-sense heritabilities from 0.21 to 0.66. Type B genetic correlations in CLB severity across sites averaged 0.59. Type A genetic correlations between 6 year CLB severity and height at the Jordan River site on western Vanvouver Island and at the site on the Queen Charlotte Islands were —0.96 and —0.86 ($p < 0.001$), respectively. Results are discussed with respect to climatic influences and prior exposure to CLB on among- and within-population variation in western redcedar natural populations and impact on gene resource management.

Resume : Des semis de thuya geant *(Thuja plicata* Donn ex D. Don) ont ete plantes a quatre endroits le long de la cote de la Colombie-Britannique. Au moment de la plantation, tous les semis etaient infectes par la brûlure des aiguilles *(Didymascella thujina* (E.J. Durand) Maire). La severite et la hauteur de la brûlure des aiguilles ont ete mesurees a divers ages allant de 2 a 12 ans. La severite de la brûlure des aiguilles etait significativement differente selon la station; la maladie etait la plus severe dans la station hypermaritime et la moins severe dans la station submaritime. Du point de vue de la severite de la maladie, la difference entre les populations etait evidente; les populations cotieres de la Colombie-Britannique situees a faible altitude etaient les plus resistantes alors que les populations de la Colombie-Britannique situees a haute altitude et celles de la Californie etaient les moins resistantes. La resistance des populations etait coherente dans les quatre stations (toutes les valeurs de $r > 0{,}90$, $p < 0{,}001$). Les coefficients de variation genetique additive pour la severite de la maladie variaient de 13,2 % a 20,1 % et l'heritabilite de 0,21 a 0,66 pour les quatre stations. Les correlations genetiques de type B pour la severite de la maladie atteignaient en moyenne 0,59 pour l'ensemble des stations. Les correlations genetiques de type A entre la severite de la maladie a six ans et la hauteur etaient respectivement de —0,96 et —0,86 ($p < 0{,}001$) a JR et QC. La discussion porte sur l'influence du climat et de l'exposition anterieure a la brûlure des aiguilles sur les variations dans et entre les populations dans les populations naturelles de thuya geant ainsi que sur l'impact pour la gestion des ressources genetiques.

[Traduit par la Redaction]

Introduction

Western redcedar (Thuja plicata Donn ex D. Don), a characteristic species of Pacific Northwest ecosystems, rarely occurs in pure stands but as a shade-tolerant tree occupying moister microsites in the understory of successional forests. Its primary associates include Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco var. menziesii), Sitka spruce (Picea sitchensis (Bong.) Carrière), and western hemlock (Tsuga heterophylla (Raf.) Sarg.) (Minore 1983). As well, it occurs as a climax, dominant species associated mainly with western hemlock in cooler and moister forests and, at higher elevations, with Engelmann spruce (Picea engelmannii Perry ex Engelm.) and western larch (Larix occidentalis Nutt.) in the interior of British Columbia.

Cedar leaf blight (Didymascella thujina (E.J. Durand) Marie) (CLB) is the most important foliar fungal disease of western redcedar (Kope 2000). It occurs on the foliage of western redcedar throughout the species' natural distribution (Kope and Sutherland 1994); however, it is more prevalent in the moist warmer environments along the coastal low elevations of the Pacific Northwest (Kope 2000). Mortality of

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