A suggestion for the survey and reporting of native plant pathogens

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By reviewing distribution records of conifer pathogens, it was found that some may have originated from specific refugia and may not have colonized the entire geographic range of their hosts. Host indexes and checklists often refer to large geographic areas and do not reflect the presence or absence of pathogens in specific geographic areas. Suspected refugia should be surveyed to determine the presence or absence of pathogens. The presence of a pathogen might indicate host resistance to it; whereas the absence of such may suggest that the host should be protected from the pathogen.

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En étudiant les données sur la distribution d'un groupe de pathogenes des conifères, on a trouvé que cartains pouvaient provenir de refuges précis et ne pas avoir colonisé toute l'aire géographique de leurs hbtes. Souvent, les repertoires et listes d'hbtes couvrent de grandes étendues géographiques et n'indiquent pas la presence ou l'absence des pathogenes dans des regions précises. Des relevés devraient être effectués aux endroits que l'on soupponne d'être des refuges pour préciser ce fait. La presence d'un pathogene pourrait indiquer une resistance de l'hbte, tandis que son absence pourrait signifier qu'il faudrait protéger l'hôte contre ce pathogene.

Introduction

Of importance to plant pathologists is finding the geographic origins of pathogens (Stevens **1961).** The geographic origin will often lead to finding the most variation in the pathogen and several evolved resistant reactions in the host (Leppik **1967).** Conversely, susceptible hosts in a geographic area not inhabited by the pathogen could be severely damaged by the pathogen if it were introduced, as has happened to North American white pines by the introduction of the blister rust fungus.

Within North America there are certain native pathogens with limited distribution which perhaps could expand their range if introduced to new areas. This is most clearly evident from the distribution patterns of dwarf mistletoes (Hawksworth & Wiens **1972)** and introduction experiments (Smith & Wass **1979).**

Recent information suggests that conifers native to British Columbia survived ice ages in several different refugia (von Rudloff & Nyland **1979;** von Rudloff *et al.* **1981;** Warner *et al.* **1982;** Wheeler & Guries **1982),** and therefore a particular species or closely related species may have more than one recent geographic origin. This may also be true of the pathogens, or perhaps some pathogens could have been excluded from some of the refugia.

These conifer species or subspecies now often overlap in distribution and interbreed within their group. Pathogens limited in their spread, such as dwarf mistletoes (*Arceuthobium* spp.) and soil fungi, may still be spreading to new geographic areas; whereas wind-borne pathogens are largely limited by environmental conditions or are isolated within or excluded from certain areas by geographic barriers such as island populations of shore pine (*Pinus conforfa)* Dougl. var. *conforfa)* and mountaintop populations of coastal alpine-fir (*Abies lasiocarpa* (Hook.) Nutt.).

The purpose of this exercise was to examine some distribution records of Pinaceae pathogens in British Columbia for anomalies which may suggest the origins of the pathogens and which may indicate any host populations which may be free of certain pathogens.

Results and Discussion

The only native soil-borne root pathogens, *Phellinus weirii* (Murr.) Gilbertson and *Armillaria mellea* (Vahl.: Fr.) Kumm. are widely distributed (Baranyay & Bauman **1972)** and, without further species subdivision and geographic reporting, no inferences can be drawn.

The distribution (Baranyay & Bauman **1972)** of *Arceuthobium americanium* Nutt.: Engelm. on lodgepole pine (*Pinus contorta* var. *latifolia*) in the southern one-half of the province and *A. douglasii* Engelm. on Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) in the southern interior suggest migration from southern refugia rather than northern or coastal refugia. The presence of A. *fsugense* (Rosendahl) G.N. Jones shore pine pathotype on *P. contorta* only on the south coastal region in specialized habitats (Wass **1976)** suggests survival in coastal refugia. The pathotype on western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) and mountain hemlock (*T. mertensiana* (Bong.) Carr.) is coastal in distribution, being absent from interior populations as well as northern and southern limits of these hosts (Hawksworth & Wiens **1972;** Fowells **1965).** This distribution suggests development and spread from the shore pine pathotype gene centre. The severity of damage also suggests that this is a relatively new host-parasite combination.

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Records of important pathogens which are lacking, possibly because the pathogen has not reached the host, for Queen Charlotte Islands (QCI) populations of shore pine and for coastal mountain top populations of coastal alpine fir include: ***Arceuthobium tsugense*** pine pathotype; ***Coleosporium asterum*** (Diet.) Syd.; ***Cronartium coleosporioides*** Arth.; ***C. comandrae*** Peck; ***C. comptoniae*** Arth.; ***Lophodermella montivaga*** Petr.; ***Melampsora medusae*** Thuem.; ***Scirrhia pini*** Funk & A.K. Parker; and ***Delphinella abietis*** (Rostr.) E. Muell.; ***Dermea rhytidiformans*** Funk & Kuijt; ***Isthmiella abietis*** (Dearn.) Darker, respectively.

The origin of coastal spruce cone rust (***Chrysomyxa monesis*** Ziller) appears to be on the QCI, since it is the only cone rust on the islands and it is only occasionally found on the continent, and then only on the alternate host.

Host indexes and checklists often cover large geographic areas and do not reflect native host gene origins. Listings covering a smaller geographic area or specific host gene origins would more likely lead to the finding of the geographic origin of native pathogens, where resistance may be found, and may indicate which native populations of hosts should be kept free of pathogens by limiting introductions. The QCI appears to be one such important area. To further this end, the distribution of all pathogens within possible refugia should be examined and their presence or absence reported.

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