Diversity of Mycorrhizal Fungi in Old-growth and Mature Second-growth Stands of Douglas-fir on Vancouver Island

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Introduction

A large number and variety of fungi, including most forest mushrooms, penetrate and sheathe feeder roots of Douglas-fir (and other conifers), forming ectomycorrhizas. Symbiosis with mycorrhizal fungi is essential for the nutrition of conifers. Ectomycorrhizal fungi also benefit their hosts by acting as a barrier to pathogenic fungi, and by increasing the environmental tolerances of roots. Perry (1985) and Schoenberger and Perry (1982) have suggested that diversity of ectomycorrhizas is important for the stability of Douglas-fir ecosystems, but little is known of the roles of different ectomycorrhizal fungi in forests. The diversity of fungi forming ectomycorrhizas increases and the species of ectomycorrhizal fungi change as forests age (Chu-chou and Grace 1990; Danielson and Pruden 1990). There is some evidence that some hypogeous fungi (those that produce no above-ground structures) may be specific to old-growth Douglas-fir (Luoma *et al.* 1991), but few studies have compared the mycorrhizal fungi of old-growth and younger stands. Objectives of this projects are: 1) to compare old-growth and mature (80-year-old) stands of Douglas-fir with respect to diversity of mycorrhizal fungi; and 2) to relate the distribution of ectomycorrhizas to soil environment.

Methods

Core samples of soil were taken from the Koksilah site in both the spring and fall of 1992, and a site in the Greater Victoria Water District (GVWD) will be sampled in spring and fall of 1993. Stumps, logs, soil on rocky areas, soil adjacent to the boles of dominant trees, and soil not in these categories were sampled independently to see if these habitats differ in their mycorrhizal fungi. All ectomycorrhizas were extracted, counted, described, photographed, and separated into types on the basis of numerous morphological and anatomical characters. Where possible, types were identified to genus and/or species on the basis of previous descriptions. Organic and mineral soil were analyzed separately. Moisture content, bulk density, pH, total carbon, total nitrogen, mineralizable nitrogen, and extractable phosphorous content are being determined for each component.

Results and Discussion

To date, 39 types of Ectomycorrhizas have been described from 36 soil cores collected at the Koksilah site. The three dominant types, *Cenococcum geophilum, Hysterangium* sp., and *Rhizopogon vinicolor* were found in both age-classes and all habitats. *Piloderma* was found in four cores, all from logs or stumps. Thirty-five minor types were represented in one or two cores each. More extensive sampling is needed to determine if there is any specialization for habitat among the minor types. Twenty-four types were found in old growth, 26 in the mature (80-year-old) stand, and 7 in both. A detailed analysis of data for the Koksilah site will be done when all soil cores collected in the fall of 1992 have been examined. Soil nutrient determinations will soon be completed for all cores taken from the Koksilah site.

References

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