

A GEOGRAPHIC VARIATION STUDY OF FRASER FIR

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Open-pollinated seeds were collected from 10 trees in elevational stands (provenances) in five major natural populations of Fraser fir (Abies fraseri (Pursch) Poir). Field trials were established at three locations in western North Carolina with 1-2 seedlings. Total height, crown diameter, branch diameter, number of buds in the terminal whorl (terminal buds), and number of buds on a first-order lateral branch (branch buds) were measured after four growing seasons in the field. An estimate of crown density was derived by multiplying terminal buds by branch buds.

There were significant differences ($p < 0.05$) among provenances for all traits measured in this study. Low elevation provenances (1500m and 1650m) tended to out-perform the high elevation provenances (1800m and 1950m). The two provenances most frequently used for commercial seed collection of Fraser fir, Roan Mountain-1650m and 1800m, were significantly poorer than the best provenances for height, crown diameter, and density. Provenance x location interactions were significant for height, crown diameter, terminal buds, and branch diameter. Significant family x location interactions were found for density, terminal buds, and branch buds.

Estimates of individual tree heritabilities indicated that most of the important traits were under moderate to strong genetic control (height = 0.42, crown diameter = 0.32, density = 0.34, terminal buds = 0.13, branch buds = 0.41, and branch diameter = 0.28), and selection should result in large genetic gains. Strong genetic correlations between height and crown diameter (0.89), density (.69), branch diameter (0.86), and branch buds (0.73) indicate that improvement for growth rate will also result in improvement of traits that are related to Christmas tree grade.