ROOT EGRESSION FROM POTLATCH CORPORATION CONTAINERIZED SEEDLINGS

R.M. Schaefer III and F.A. Kidd

Potlatch Corporation

Lewiston, Idaho

Trees grown from seed in situ normally develop a strong taproot and well-distributed laterals. Conventional cultural techniques of seedling production (whether bare-root or containerized seedlings) stimulate root promulgation, but all means of artificial regeneration can hamper root distribution in soil at outplanting.

Concern over seedling development after outplanting has been the subject of many studies. Of particular interest has been the effect of root deformation on seedling survival and height growth. Unfortunately, published reports offer conflicting conclusions whether seedling performance is detrimentally affected by the deviation from normal root form by plugs or bareroot stock.

The 1978 symposium Root Form of Planted Trees in Victoria, B.C. (1) addressed containerization. The symposium did little to answer specific questions on the effect of root form affecting outplanting success, but did provide an overall "general" guide in the greenhouse culture and planting of trees. Consensus opinion of symposium participants was that initial root aberrations are influenced by:

Nursery Practices
Species
Site
Soil
Environmental Stress

When Potlatch Corporation recently (1977) entered into a program of seedling production, operational constraints required an indepth analysis of how the above variables would interact to produce a vigorous shoot, but gave short-shrift to root development. The climatic conditions suitable for spring planting of bare-root stock are erratic and insufficient in duration to accomplish our regeneration goals. The container tree can easily withstand the environmental stresses encountered during spring planting on most of our north Idaho timberlands.

Research has since shown that initial root morphology can affect the growth rate, value, and useful life of planted seedlings (2). In view of the huge economic impact of planting to Potlatch and the knowledge that the extent of regeneration will increase, we felt a cursory examination of "Potlatch's roots" was warranted. Our objective was to assess whether our containerized seedlings were subject to root malformations which impeded initial

egression from plugs and resulted in growth and survival reductions after outplanting.

GREENHOUSE POT STUDY

Operational 1981-sown Douglas-fir and western white pine seedlings were removed from storage in February, 1982, and transplanted into three-gallon plastic pots. Seedlings were irrigated and diurnal temperatures were kept near normal to allow the natural sequence of breakage of dormancy and root and shoot growth induction.

Root egress was monitored at three-week intervals by carefully removing the peat-vermiculite potting mix and observing the extent and proliferation of lateral and tap-type root formation.

White pine seedlings exhibited the earliest root development. Expanding laterals were observed after 30 days. Root growth was constrained by pots after 70 days. Douglas-fir roots initiated rapid growth after 50 days and became pot-constrained after 120 days.

Root growth was observed along all peripheral sides of the "plug." There was no evidence that new growth was initiated preferentially from the bottom of the plug.

Summary observations of root growth potential of Potlatch containerized plugs were that (a) vigorous root growth was initiated prior to shoots breaking dormancy; (b) no inhibition of lateral root extension could be attributed to container "plugs"; and (c) root proliferation due to physiological vigor should enable planted seedlings to withstand environmental stress (i.e., low soil moisture and greater transpirational water loss) with greater ease than natural germinate seedlings with a more sparse rooting habit.

FIELD PLANTATION SURVEY

A valid criticism of our observations of root egress in potting mix is that it may not be indicative of root elongation in soil. To verify our initial findings, Potlatch plantations, dating from initial establishment (1976) through 1982, were surveyed for root growth of planted Douglas-fir and western white pine.

The retrospective "dig and look" approach gave good visual evidence that roots were in excellent physiological and morphological condition. No evidence of plug-restricted root growth was observed for either species at any age.

An indirect indication of healthy roots was shown by the rapid height growth and luxurient conditions of shoots. In nearly all cases, excellent root egress occurred from plugs. Robust lateral roots, as well as tap-type roots from the bottom

of the plug, were quickly developed during the first growing season.

FACTORS INFLUENCING ROOT DEVELOPMENT

We believe our successful root establishment can be related to several factors influencing root growth, the major components being greenhouse cultural practices and plantation site characteristics.

Greenhouse Culture

Quality nursery practices (3) are, we believe, container-related as well as growth regime-related. The styroblock container, we feel, has advantages which, in our climate, produce a superior root system compared to other containers. The insulating qualities of the block, when combined with good irrigation and fertilization regime, produces a prolific root system with active root tips at the bottom and along all peripheral edges of the plug. Close observation has shown that this allows for rapid root egress from all portions of the plug within two weeks following spring planting.

The nutrient regime is formulated to promote not only a quality shoot but a very high quality root system ready to aggressively perform in the field. This is accomplished through rigorous attention to nutrition (4) and a hardening-off schedule which induces dormancy. Following hardening, the root growth potential is guarded by placement of the seedlings in cold storage. This ensures the seedlings are dormant until outplanting in April-June.

Planting Site

The majority of current Potlatch planting sites are of high site quality supporting residual mature stands of western red cedar, western white pine, and grand fir. The majority of these areas are prepared for planting by clearcutting followed by a broadcast burn. Some dozer piling and burning and chemical site preparation are also being used.

Good site preparation is synonymous with survival and growth. Root systems will develop more rapidly under conditions which reduce competition and/or physiological stress. Broadcast burn areas also provide some nutrient enhancement which encourages both root development and top growth (5).

Soil

Soils on Potlatch fee lands are mainly decomposed granitics overlaid with 14-16 inches of fertile ash cap. This soil, being quite friable, provides the egressing root system easy penetration into the soil surrounding the plug. Generally speaking, less root volume has been observed in areas planted in

our heavier textured soils. Natural regeneration seedlings seem to follow the same general pattern.

CONCLUSION

In summary, the success of "Potlatch's roots" is a combination of the interactions of quality nursery practices combined with adequate site preparation and general condition of the soils. We feel the root egress, as now observed, will provide the maturing tree with good mechanical stability and sufficient absorbing surface for water and nutrients to sustain rapid growth.

LITERATURE CITED

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