Trees Grow Better With Water

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Seedlings of shining gum, Eucalyptus nitens *[(Deane and Maiden) Maiden] were field planted during early summer near Christchurch, New Zealand. Half of the seedlings received 200 ml of water containing nutrients (Peters Excel at 2 g/l), applied to the soil surface around the root collar after planting. The other half received no treatment. Differences in height growth were readily apparent within 1 month and continued for the rest of the trial. Twenty-five percent of the unwatered plants died within 1 month, whereas 100% of the watered plants remained alive. The marginal increase in cost of applying water to seedlings immediately after planting should be easily justified in terms of improved seedling establishment and subsequent growth.* Tree Planters' Notes 46(2):46-47; 1995.

The success of plantation establishment is frequently measured in terms of survival. Rarely is the rate of growth considered, other than in a more general sense when comparing species and site growth potential ranking. In New Zealand, bareroot seedlings are the traditional planting stock, planted out during the wetter part of the year in winter and early spring (Revell 1982). Changing to containerized stock allows greater flexibility in terms of planting period (Faulds and van Dorsser 1979, Barnett and Brissette 1986).

Application of water after planting is commonly used to improve plant establishment under particularly harsh conditions (Rodgers 1994). Volumes in excess of 1 liter per plant have been suggested (Bainbridge and others 1993, Haigh 1993). Evidence from vegetable seedling trials indicates that simply ensuring a saturated root plug at time of planting is the most important aspect to rapid root growth from the root plug after planting (Kratky and others 1980). This can be done by saturating the root plug immediately before planting (Nelson 1994) or applying sufficient water to the upper soil profile to saturate the root plug after planting (Cox 1984). Neither practice would be considered practical in a normal plantation context, but a directed application of a small volume of water, just sufficient to saturate the root plug and achieve hydraulic contact with the surrounding soil, is potentially feasible.

This trial was established to determine whether a small volume of water applied after planting would have a beneficial impact on plant survival and growth. Planting in summer was chosen as this is the driest time of year in the mid-Canterbury Plain.

Materials and Methods

Seedlings of *Eucalyptus nitens* were grown in Plantek 63F side-slotted plastic containers (Lannen Plant Systems, Finland) using a commercial blend of peat and pumice containing 6-month Osmocote® granules. Plants were watered as necessary during growth. Planting occurred in early December 1994 into rip lines within spot-sprayed planting positions along a straight north/south fence line. The site, a Lismore Stony soil on an alluvial-derived flood plain, is 15 km south of Christchurch, New Zealand. The upper layer of the soil was completely dry, but soil showed signs of moisture within 100 mm of the surface. Plants were in the size range of 12 to 18 cm tall and 3- to 4-mm collar diameter, allocated randomly to the planting positions.

Alternate seedlings were treated after planting by pouring 200 ml of water containing nutrients (2 g/1 Peters Excel®) onto the root collar area. The other seedlings received no supplemental water or nutrients. No attempt was made to separate the nutrient effect, because the additional cost of having some nutrient in the water would be negligible compared to the cost of watering plants after field planting.

Individual plants were monitored and height growth measured monthly. Height data were analysed by F-test (analysis of variance with variable number of replicates to eliminate plots where plants had died), n = 16 for each treatment, using single plant replicates.

Results and Discussion

The Canterbury Plains are generally dry in summer, but this particular summer was unusually hot and dry. Very little precipitation fell during the first 4 months after planting. Rainfall for the months October 1994 to May 1995 was 20, 22, 24, 32, 25, 32, 30, and 39 mm, respectively.

One month from planting, both growth and survival differences were apparent. Unwatered seedlings were showing obvious signs of water stress, such as wilted leaves, shoot dieback, and 25% mortality. Watered plants suffered no mortality and obvious height growth had occurred.

Subsequent measurements show that, while all plants grew during the period, watered plants maintained their lead in absolute height growth and showed 30% more growth from month 2 (figure 1).

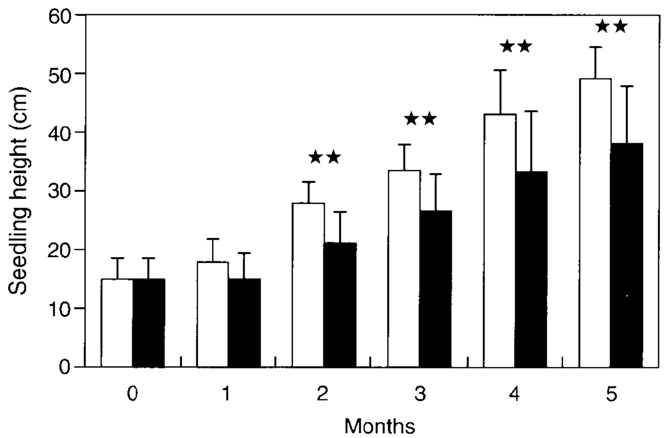

Figure 1— *Height growth of* Eucalyptus nitens *seedlings planted in summer and treated with 200 ml water applied to the root collar after planting , or no treatment* ■. *The standard error is indicated for each bar. The asterisks indicate treatment effects that are significantly different (F-test,* $\alpha = 0.01$*).*

Differences between treatments for months 2 through 5 were significantly different (" = 0.01). Untreated plants were not only generally shorter but were also more variable in their growth.

These data indicate the importance of rapid root establishment from the root plug into the surrounding soil to achieve a high survival rate, as well as early gains in growth. The earlier height growth of the treated plants and subsequent continued lead in plant size is anticipated from other trials in which larger seedlings at planting maintain their advantage, even years later (Simpson 1994).

A longer term trial, and especially covering more planting times, sites, and species, is required to fully evaluate the costs and benefits of seedling watering. The growth differential shown by this trial suggests a highly positive economic impact.

Conclusions

Application of even a small amount of water to seedlings immediately after planting has a profound beneficial impact on both survival and early resumption of growth after planting. The marginal increase in cost of applying water to seedlings immediately after planting should be easily justified in terms of improved seedling establishment and subsequent growth.

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