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Survival and growth of drought hardened *Eucalyptus pilularis* Sm. seedlings and vegetative cuttings

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Abstract Forestry requires low mortality of transplanted seedlings. Mortality shortly after planting is often associated with inadequate hydration of transplants. Seedlings can be hardened to the drought conditions they may experience after transplanting by exposing them to controlled drought conditions in the nursery. *Eucalyptus pilularis* Sm. seedlings were drought hardened by providing nil (severe treatment) or half (mild treatment) the daily irrigation routinely received (control treatment) for up to two non-consecutive days per week during the last 4 weeks of growth in the nursery. Drought hardening reduced stem diameter, seedling leaf area, leaf area per root biomass and seedling quality measured by the Dickson quality index, but increased root:shoot ratio. Hardened seedlings had lower stomatal conductance and leaf water potential on the days they received less irrigation than the control treatment. Hardened seedlings had greater stomatal conductance and were less water stressed than seedlings experiencing drought for the first time indicating hardened seedlings had adjusted physiologically to drought. Survival after transplanting in the controlled drought environment in a glasshouse was enhanced by the hardening treatments. Non hardened seedlings that had had their upper leaves manually removed immediately prior to transplanting to reduce leaf area (top-clipped) had similar survival to hardened seedlings. Stomatal conductance and leaf water potential after transplanting were higher in hardened and top-clipped seedlings than unhardened control seedlings or vegetative cuttings. Survival in the field trial was over 95% for all treatments, possibly as rain fell within 4 days of planting and follow-up rain occurred in the subsequent weeks. Neither the hardened or top-clipped seedlings planted in the field trial had reduced growth, increased propensity to form double leaders or worse stem form than control seedlings when measured at age 3 years.

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