From Forest Nursery Notes, Summer 2008

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Available online at www.sciencedirect.com

ScienceDirect

Forest Ecology and Management 255 (2008) 1305–1314

Forest Ecology and Management

www.elsevier.com/locate/foreco

Hydrogel applied to the root plug of subtropical eucalypt seedlings halves transplant death following planting

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Received 2 February 2007; received in revised form 16 October 2007; accepted 18 October 2007

Abstract

Plantation establishment requires high survival of transplanted seedlings. The experiments described in this paper examined methods to reduce death of *Eucalyptus pilularis* Smith and *Corymbia citriodora* subsp. *variegata* (F. Muell.) A.R. Bean & M.W. McDonald seedlings shortly after planting. Two products were tested: a fine grade water-retention hydrogel was examined as a means of providing water to seedlings, and a kaolin clay particle film mixture sprayed onto leaves was examined as a means of reducing leaf heating and dehydration. Both products were tested in a field and a glasshouse situation. Seedlings were planted with a pottiputki for field experiments or a hand trowel for glasshouse experiments. Seedlings were not watered in the glasshouse trial. Hydrogel was applied by immersing the seedlings' root plug in a fully hydrated solution of hydrogel prior to planting which supplied each seedling with an additional 20 g weight corresponding to 20 ml of water. Kaolin clay particle film was applied by coating the leaves prior to planting. Field trials showed the majority of seedling death occurred between 1 and 4 weeks after planting with seedling health improving during this period following rainfall events. Five months after planting in the field hydrogel-treated seedlings had 12 and 5% death in *E. pilularis* and *C. citriodora* subsp. *variegata* seedlings compared to 26 and 14% death, respectively in control seedlings. The glasshouse trial showed hydrogel-treated seedlings remained healthier for longer. Hydrogel enhanced seedling survival because it provided extra moisture to seedlings, or it promoted contact between the root plug and the bulk soil. Kaolin clay particle film showed a non-significant trend of improving survival of field planted seedlings. There was also a non-significant trend indicating that kaolin clay delayed death of *C. citriodora* subsp. *variegata* seedlings when time between application and planting was increased. Species attributes such as presence of lignotubers and smaller leaf area in *C. citriodora* subsp. *variegata* than *E. pilularis* may account for its higher survival, although seedling morphology could not easily be related to seedling survival.

Keywords: Eucalyptus; Kaolin; Plantation establishment; Seedling survival; Transplant shock

1. Introduction

Traditional sources of hardwood sawlogs are gradually being replaced with plantation-grown sawlogs around the world (Hagler, 1999). For these plantations to be economically successful cost effective means of ensuring high survival of newly planted seedlings must be achieved. In subtropical Australia shortage of suitable land for plantations is forcing establishment of plantations onto more marginal land with higher inherent dangers of seedling failure due to lower rainfall and soil moisture. Reducing the risk of seedling death is a valuable insurance mechanism allowing for continued expansion of new plantations.

Two traditional forestry species of subtropical Australia being planted into more marginal plantation land include *Eucalyptus pilularis* Smith (Blackbutt), and *Corymbia citriodora* subsp. *variegata* (F. Muell.) A.R. Bean & M.W. McDonald (Spotted gum). *C. citriodora* subsp. *variegata* is considered less susceptible to death by transplant shock than *E. pilularis*, although both species can suffer from greater than 15% seedling losses within the first 2 months of planting (Thomas, FNSW unpublished data). However no studies have directly compared the survival of these species. Many factors can impact on seedling survival including species, site location, soil type and moisture availability, post-transplant weather conditions and seedling quality (e.g. Close and Davidson, 2002; Villar-Salvador et al., 2004; Close et al., 2005; South et al., 2005; Dominguez-Lerena et al., 2006). Many quality criteria of seedlings such as larger height or biomass, lower shoot:root ratios or thicker leaves are often associated with increased

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0378-1127/$ – see front matter.
doi:10.1016/j.foreco.2007.10.035