COMPARISON OF CLAY SLURRY AND AGRICOL ROOT DIPS APPLIED TO 1-0 SLASH PINE SEEDLINGS

G. J. Bacon, P. J. Hawkins, and D. Jermyn
Department of Forestry, Queensland, Australia

A clay slurry root dip applied immediately after lifting to 1-0 slash pine stock proved superior to a comparable Agricol treatment in terms of improved seedling field performance and lowered product cost.

The principle of minimizing root desiccation injury, especially to open root planting stock, during the nursery-field transplanting operation is well recognized. Consequently, when changes were introduced into various aspects of slash pine establishment practice in south east Queensland, along with a concomitant, increased risk of root exposure and drying (table 1), attention was directed towards the protective potential of root dips. Both clay (*3, 6*) and Agricol (*4, 5*) have been reported as reducing root drying and enhancing field survival when applied to roots after lifting. These two dips were evaluated under local conditions.

Materials and Methods

Four comparison tests were conducted at two Queensland coastal centres, one test at Gympie (26°10'S) and three at Beerburrum (26°45'S), each using 1-0 slash pine (*Pinus elliottii* Engelm. var. *elliottii* L. and D.) seedlings raised from drill sowings of orchard quality seed. Stock were hand lifted in mid-winter (July), shaken to remove excess nursery soil, and roots dipped immediately into either a clay or Agricol mix. Sufficient powdered kaolinite had been stirred into water to obtain a creamy consistency in the mix while Agricol, the trade name for the hydroscopic gelatinous compound sodium alginate, was made up at the recommended 1 percent concentration (*1*).

Subsequent root exposure to both treated and undipped (control) plants was minimized by covering roots during transport to the field and using moistened sphagnum moss-lined planting bags.

Experimental design incorporated 50-tree line plots per treatment in a 3 (treatment) by 4 (replication) randomized complete block. All plantings were made the same day as lifting at an initial espacement of 3.1 m by 1.2 m using the bar-slit method on good quality plough-mounded lateritic podzolic sites.

Results and Discussion

Field performance is summarized in table 2. The overall superiority of the clay slurry root dip treatment is readily apparent. We infer that an adhering clay layer provides the best resistance to root desiccation during the transplanting and initial establishment phases. Overall the Agricol dip did improve field survival relative to that of untreated controls, nevertheless, it was distinctly inferior to the clay treatment. Furthermore, it is cheaper to treat stock with locally produced clay than with imported Agricol; product costs are 25 cents and 35 cents per 1000 seedlings treated respectively.

Table 1.—*Root desiccation risks accompanying modifications to 1-0 slash pine establishment practice*

Operation	Change in routine practice	Cause of increased desiccation risk
Nursery production	Amalgamation of smaller nurseries into two production centres	Lengthening of stock transport hauls and storage times
Stock lifting	Requirement that nursery beds be saturated prior to lifting waived	Benefits of root puddling lost
Seedling packaging	Baling (two opposing bundles of seedlings laid out roots to roots and tightly wrapped in position with hessian) abolished in lieu of upright stacking in trailers	Root systems more exposed
Site preparation	Introduction of plough mounding	Exposed cultivated mounds very susceptible to rapid drying

Table 2.—*The influence of root dips on first year field survival and height increment of 1-0 slash pine seedlings*

	Test 1[1]		Test 2		Test 3		Test 4
Root dip	Surv.[2]	Ht. Inc.	Surv.	Ht. Inc.	Surv.	Ht. Inc.	Surv.
	(percent)	*(cm)*	*(percent)*	*(cm)*	*(percent)*	*(cm)*	*(percent)*
Clay	92.9	28.5	98.8	36.5	62.4	26.4	93.4
Agricol	72.4	24.8	97.0	32.3	40.4	29.0	90.6
Undipped Controls	77.6	25.4	96.4	36.1	29.8	24.4	77.8
Significance[3]	***	*	*	**	**	NS	***
	(8.9)	3.7	(4.0)		2.7	(11.7)	(10.2)

[1]The one month pre- plus one month post-plant rainfall for tests 1 to 4 are 65, 489, 12 and 52 mm respectively. Test 4 conducted at Gympie, remainder at Beerburrum.

[2]Negligible mortality after first year.

[3]Analysis of survivals conducted on arcsin square root transformed data. LSD's ($p<0.05$) in parentheses remain transformed. NS = Not significant, * = $p<0.05$, ** - $p<0.01$, *** = $p<0.001$

As expected, root dips elicit little improvement in field survival under ideal planting conditions (e.g. little root exposure, overcast skies and good follow-up rains (Test 2 conditions)). However, since weather conditions cannot be predicted with accuracy it appears wise to routinely dip treat all planting stock. Davey's (*2*) comment that the standard use of a clay root dip is advisable as an insurance against the occurrence of less than ideal conditions is pertinent here.

Accordingly, a clay slurry root dip treatment applied immediately after lifting is prescribed for 1-0 Slash pine in Queensland.

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