SURVIVAL AND GROWTH OF SALIGNA EUCALYPTUS SEEDLINGS TREATED WITH A TRANSPIRATION RETARDANT IN HAWAII

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In Hawaii, seedlings of saligna eucalyptus *(Eucalyptus saligna* Sm.) planted with bare roots often have low survival. One reason is that seedlings wilt before the roots of this hardwood species become established and can supply soil moisture. More seedlings would survive if they were planted with balled roots, but they would be costlier to raise and plant than bare-root seedlings. Another alternative is to reduce the water requirement of seedlings until the roots have become established.

On the U.S. mainland, attempts have been made to reduce the water requirements of coniferous seedlings[2] by using transpiration retardant chemicals. Several such chemicals are commercially available.

I tested the effects of a product called All-Safe[3] on survival, growth, and vigor of transplanted bareroot saligna eucalyptus seedlings. This transpiration retardant consists of vinyldiene copolymers formulated into a weather-resistant, film-forming material. The manufacturer claims that the material allows the passage of oxygen and carbon dioxide into the plant while it restricts the movement of water vapor from the plant.

The Study

The test seedlings were lifted from their beds at the Central Tree Nursery of the Hawaii Division of Forestry and treated in one of four ways:

1. Foliage spray.-Seedlings were sprayed with a combination of All-Safe-captan-malathion[4] solution while still in the beds, about 2 hours before lifting. The roots were dipped in the captan malathion solution just before packing.

2. Foliage dip.-Tops were dipped in the All-Safecaptan-malathion solution, and then the roots were dipped in the captan-malathion solution.

3. Full dip-Seedlings were completely submerged in the All-Safe-captan-malathion solution.

4. Control.-Bundles of seedlings were fully submerged in the captan-malathion solution. After treatment, seedling roots were packed in damp moss and wrapped with plastic.

Seedlings of each treatment were planted on three sites, representing moist, dry, and very dry sites. The moist site is on the Hamakua Forest Reserve; the very dry site in the Central Tree Nursery, both on the island of Hawaii. The dry site is on the Puu Ka Pele Forest Reserve on the island of Kauai. The physiographic features of the three sites are as follows

	Moist site	Dry site	Very Dry site
Rainfall (inches) ..	80	40	20
Elevation (feet) ...	2100	2350	2600
Aspect	northeast	west	level
Slope (percent) ...	11	7	0
Soil	silty clay	silt loam	sandy loam
Drainage	good	good	good

The experimental design consisted of four randomized blocks, with four plots within each block. Each plot, or row, was planted with 16 trees receiving one of the four treatments.

The seedlings were examined 1, 4, and 12 months after planting. Tree height was measured to the nearest half foot. Tree vigor was rated good, average, poor, or dead-depending on the condition of the terminal and leaves. Seedlings were weeded during the examinations.

Results and Discussion

Moist Site

Survival was not a problem on the moist site94 percent of the control seedlings survived after 1 year (table 1). Differences in survival, by treatment, were not significant at the 5-percent level.

1 Research Forester, USDA Forest Service Pacific Southwest Forest and Range Exp. Sta.

2 A review of the literature did not reveal tests with hardwood species.

3 Manufactured by Certified Laboratories, Forth Worth, Texas.

4 A1I seedlings shipped from the Central Tree Nursery are first fully submerged in a captan-malathion solution. So that the seedlings in this study would receive as normal a treatment as possible, captan, a fungicide, and malathion, an insecticide, were added to the All-Safe solution, as recommended by the manufacturers of All-Safe.

TABLE 1.—*Survival, vigor, and height of saligna eucalyptus seedlings treated with transpiration retardant and outplanted on moist and dry sites in Hawaii*

Site and treatment	Survival		Vigor of live seedlings						Height		
			Good		Average		Poor		Minimum	Average	Maximum
	1 mo.	12 mos.	1 mo.	12 mos.	1 mo.	12 mos.	1 mo.	12 mos.	12 months		
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Feet*	*Feet*	*Feet*
Moist:											
Spray	100	97	9	98	30	2	61	0	1.5	3.5	6.5
Foliage dip	100	98	14	98	51	2	35	0	1.5	4.0	7.0
Full dip	100	88	11	96	44	4	45	0	2.0	3.5	6.0
Control	100	94	5	97	31	3	64	0	1.5	4.0	7.0
Dry:											
Spray	70	31	0	95	0	5	100	0	1.0	4.0	8.5
Foliage dip	89	53	0	97	0	3	100	0	1.0	4.0	7.5
Full dip	88	50	0	100	0	0	100	0	1.0	5.0	12.0
Control	94	33	0	95	0	5	100	0	1.0	4.0	6.5

Seedlings planted on moist sites must make early and rapid growth to compete with weeds. Saligna eucalyptus seedlings planted bare root tend to die back, and therefore, often compete poorly. Treating the seedlings with All-Safe reduced planting shock. After 1 month, seedlings given the foliage dip and the full dip treatments had significantly (1-percent level) higher vigor than the controls. Sprayed seedlings had slightly better vigor than the control seedlings.

With favorable moisture conditions, most of the seedlings soon recovered from planting shock. After 4 months there was little difference in seedling vigor, by treatment.

The average heights of the seedlings given the different treatments were not significantly different (5-percent level) after 1 year. The difference in average heights, by treatment, was only a half foot.

Dry Site

Spraying seedlings with All-Safe, as recommended by the manufacturer, had no effect on seedling survival (table 1). Dipping the seedlings, however, increased survival significantly (5-percent level).

All seedlings suffered from transplanting, and all had poor vigor after 1 month. Seedlings given the foliage dip and full dip treatments, however, were generally more vigorous than the sprayed or the control seedlings. After 1 month, a significantly higher percent (1-percent level) of the dipped seedlings had started new growth than had the sprayed or the control seedlings. Eighty-eight percent of the trees that had started new growth after 1 month were also growing after 1 year; only 25 percent of the trees that had not started new growth after 1 month were growing after 1 year. The more vigorous seedlings survived the dry periods.

Seedlings that did recover from planting shock had about the same growth rates. After 1 year there were no significant differences (5-percent level) in the heights of seedlings.

Very Dry Site

On the very dry site, All-Safe had no practical effect on seedling survival. Even with the aid of the transpiration retardant, the highest survival rate after 4 months was only 8 percent. We concluded that this site was too dry for bare-root saligna eucalyptus seedlings to survive unless they are irrigated periodically.

Conclusions and Recommendations

Spraying seedlings with All-Safe, the treatment recommended by the manufacturers, gave results similar to those of the control seedlings in almost every

instance. This treatment, therefore, offered no advantage.

Dipping significantly reduced the effect of planting shock on seedlings planted on the moist and dry sites. On both sites, dipped seedlings began growing sooner than the sprayed or control seedlings. On the dry site, early growth of dipped seedlings was related to their significantly higher rate of survival over that of the controls after 1 year. Height differences, by treatment, were not significant after 1 year on either the moist or dry sites. Seedling survival in all treatments was negligible on the very dry site.

Dipping seedlings in All-Safe aided early seedling establishment and survival, but there were not enough other benefits to recommend that this transpiration retardant be used as a standard procedure. Further study is needed to determine if survival and early growth of seedlings can be increased.

MODIFIED PORTABLE VACUUM SPEEDS UP CLEANING OF SEED DRILL HOPPERS

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Seed drill hoppers have to be cleaned between seed lots. Sometimes, more seed may be put into the hoppers than is necessary to sow the beds. If an appreciable amount of seed is left at the end of a run, removing the seed from the hoppers is easier than running it through the spouts into containers.

At the James W. Tourney Nursery, Watersmeet, Mich., seed drill hoppers are cleaned with a small auto hand vacuum cleaner fixed with a homemade cone-shaped extension tube attachment (fig. 1). The $9.95 hand vacuum plugs into the cigarette lighter of the tractor. Tree seed is sucked from the hoppers, while the seed drill is stopped on the seedbed between lots or at the end of a run.

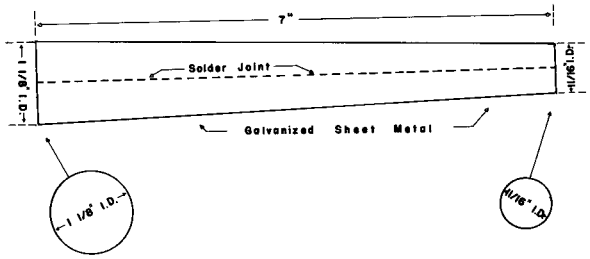

Figure 1.—Homemade cone-shaped extension tube attachment for use with auto hand vacuum cleaner.

FOREST PEST LEAFLET

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FPL-45 Black-Headed Budworm
FPL-47 Sitka Spruce Weevil
FPL-56 Monterey Pine Ips
FPL-59 European Pine Shoot Moth
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