WINTER PLANTING POTENTIAL OF FOUR EUCALYPT SPECIES IN SOUTH FLORIDA

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Almost 100 percent of eucalyptus seedlings survived when planted in December, during southwest Florida's driest winter. Eight-six percent of *E. camaldulensis* and *E. tereticornis* seedlings and 38 percent of *E. grandis* and *E. robusta* seedlings survived February planting of the same winter.

Drought and freezing affect the choice of eucalypt species and the planting season in south Florida. *Eucalyptus camaldulensis* Dehn. and *E. tereticornis* Sm. are recommended for planting between Orlando and Arcadia because they have more freeze hardiness than E. grandis Hill ex Maiden and E. robusta Sm. South of Arcadia, the faster growing *E. grandis* and *E. robusta* are recommended for industrial plantations on slowly drained sands of flatwoods and palmetto prairie, and the drought-hardier *E. camaldulensis* and *E. tereticornis* for droughty ridges. Seedlings usually are planted in the early part of the rainy season—late June through July. Planting in August and September has been necessary at times because of problems in scheduling all planting early in the rainy season, but planting in the latter months is not recommended. Planting has not been done in the dry season (October to June) because of the reasonable belief that the seedlings would die from drought or freezing.

The south Florida climate is transitional between tropical wet-and-dry and subtropical humid (*3*). Occasional, sudden freezing temperatures, which can be expected anytime from late November to early March, distinguish the area's climate from the typical tropical wet-and-dry. Seedlings planted in early summer usually grow large enough before the first frost to resist all but the worst inversion freezes. Then, even if killed back, they usually resprout. Summer planted seedlings easily survive the dry season's drought. However, severe droughts do occur unexpectedly in summer, and when they coincide with planting, many seedlings die.

Winter planting of eucalypts in south Florida, in addition to summer planting, could result in more efficient use of nursery and field equipment and labor. There have been no formal tests of winter planting of eucalypts in south Florida. Results of informal experiences have been confounded by the use of bareroot seedlings, which do not survive as well as the container-grown plug seedlings used now. Therefore, plug seedlings of the four eucalypt species used in south Florida were compared in a winter-planting experiment.

METHODS

Two separate plantings were established side by side: one on December 20, 1973, and one on February 8, 1974. A planting consisted of 32 blocks, each containing one seedling of each of the four species planted at random.

The seedlings grew in wedge-shaped, plastic containers filled with peat-vermiculite mix. In these custom-built containers, the roots of the seedlings air-pruned and became fibrous. The typical plug of roots, peat, and vermiculite formed a 2- by 1.2-inch rectangle at the top (at root collar) and tapered for 4.3 inches to an ax-edge at the bottom (figure 1). Seed was sown on August 27 for the December planting and on October 2 for the February planting. Seeds were obtained from Florida seed orchards. Average seedling heights by species ranged from 9 to 12 inches for the December planting and 11 to 16 inches for the February planting.

The planting site near Corkscrew, Collier County, was an Oldsmar fine sand (a sandy, siliceous, hyperthermic member of AIfic Arenic Haplaquods). Rock phosphate at the rate of 2,000 pounds per acre had been spread on the site before it was bedded for an industrial planting in summer 1973. Part of the prepared area was not planted and was used for the winter planting experiment. The unplanted beds were disked flat to reduce grass and other competition in early November.

In the December planting, the seedlings were dropped into a wedge-shaped hole punched into the ground with a custom-built dibble. Gaps between plugs and soil were closed by foot pressure. Root collars were buried about 1 inch deep. At some planting spots, dry surface soil had to be scuffed aside before punching a hole to prevent cave-in.

The day of the February planting was desertlike-the high tem-

Figure 1.—*Handplanting a wedge-shaped E. robusta seedling in February.*

perature was 82° F, and strong, dry winds blew. The soil was too dry to mold a hole for the wedge plugs, even when 2 inches of topsoil were scuffed away. The seedlings were planted by pushing a thin-wedge dibble 10 inches into the soil, then sliding the seedling's plug into the gap between the dibble blade and soil as the dibble was lifted from the soil (figure 1). A sideways pull as the dibble was lifted created a momentary gap for the plug. Again, root collars were covered with about 1 inch of soil, and the soil around the seedling was firmed by foot pressure. If grass occurred at a planting spot, it was hoed out before planting.

A recording thermograph was located 4.5 feet above ground, 500 feet from the site. Rainfall was measured on site with a 2.75-inch-diameter canister with a floating disk evaporation baffle. This instrument gave a good estimate of rainfall when read within a day of a storm. Because of evaporation, increasing underestimates would be expected as the reading interval increased. An estimate of total rainfall was made from rainfall data from the nearby Corkscrew fire tower and an official weather station 10 miles away.

Survival was analyzed statistically by a simultaneous test for frequency data (*2*) and heights by a common analysis of variance. No analysis was made of growth because records of planting size were not kept by individual trees.

RESULTS

During 1973-74, the 6-month period from October to May had the least amount of rainfall ever recorded for the dry season in southwest Florida. Less than 8 inches of rain fell on the experimental site. However, six-tenths inch fell on the planting day of December 20. Almost no rain occurred after this until February 20, when one-half inch fell. Heavy, soil-penetrating rains did not relieve the drought until the end of May. Temperatures dropped just below freezing on February 11 and 12 and killed some new, just expanding leaves.

All but one seedling planted on December 20 survived; 62 percent of the February plants survived (table 1). Survival in the February test differed significantly among species -many more seedlings of *E. camaldulensis* and *E. tereticornis* survived than seedlings of *E. grandis* and E. robusta. The survival difference between *E. grandis* and *E. robusta* was pronounced, but was not statistically significant even when the experiment error probability was increased to 5 percent.

Plant heights 6 months after planting were inversely related to survival (table 2). *E. grandis*, the lowest in survival percentage, was the tallest; while *E. tereticornis*, which survived well, was the

Table 1.—*Survival in south Florida of winter-planted eucalypts 6 months after planting*

Eucalyptus species	Percent survival[1] of seedlings planted on:	
	12/20/73	2/8/74
E. camaldulensis[2]	100	88
E. tereticornis[3]	100	84
E. robusta	100	52
E. grandis	97	25

[1]Values unconnected by a line are significantly different with an error probability of 0.5 percent.
[2]Spanish strain.
[3]St. Leo strain.

Table 2.—*Heights (inches)[1] of eucalypts 6 months after winter planting in south Florida*

Eucalyptus species	Height in inches for seedlings planted on:	
	12/20/73	2/8/74
E. grandis	42	44
E. robusta	32	38
E. camaldulensis[2]	31	37
E. tereticornis[3]	26	27

[1]Values unconnected by a line are significantly different with an error probability of 5 percent.
[2]Spanish strain.
[3]St. Leo strain.

shortest. The rank order of the species for 6 months growth (6 months height minus planting height) was the same as the height rankings. A species grew almost the same amount over 6 months regardless of planting date.

DISCUSSION

E. camaldulensis and *E. tereticornis* were more drought hardy than *E. grandis* and *E. robusta, E. grandis* and *E. robusta* apparently need moister conditions to become established than the other two species. Once established, however, they survived severe drought. This experiment is a good test of drought tolerance on sandy flatwoods—a more severe drought on these soils would be rare.

However, frost hardiness was not well tested. In some years, colder temperatures could be expected at the experimental site. For example, during a 30-year period at LaBelle, a site 18 miles NE, temperatures fell to 28° F or lower in 57 percent of the winters and to 26° F or lower in 23 percent of the winters (*1*).

Eucalyptus grandis and *E. robusta* planted in December had a higher survival rate than similar seedlings machine planted in the adjacent plantation in July. There, 76 percent of the *E. grandis* and 87 percent of the *E. robusta* became established. The consequences of strong freezes on winter-planted seedlings are unknown, but intuitively one feels the effect could be serious. For instance, would resprouting occur if the above-ground tissue were killed? Delaying planting until late winter-early spring sharply reduces the chance of a strong freeze, but the average soil moisture is expected to be less than in December. Therefore, the results would probably be comparable to the February planting.

There is a chance of successful winter planting of *E. camaldulensis* and *E. tereticornis* on flatwoods and palmetto prairie. This is not, however, apt to be practiced because these two species grow slower than *E. grandis* and *E. robusta* on such sites. The two hardy species might be planted in winter on ridges, where air drainage moderates freezes in comparison to the lower lying flatwoods and palmetto prairie. But on the ridges, drought should be greater. Winter planting of eucalyptus is a possibility, but it will take several years to glean sufficient data to determine its feasibility.

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