Acclimatization of Tropical Trees for Interior Use[1]

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Abstract. **Appearance of container grown *Fiscus benjamina* Linn. (weeping fig) and *Brassaia actinophylla* Pov. (schefflera), as measured by plant grade, density and leaf retention after 10 weeks under an interior environment, was improved over plants grown in full sun when plants were previously acclimatized under 40 or 80% shade for 5 or more weeks. There was also an increase in leaf retention as interior light supplied 12 hours/day 7 days a week, increased from 270 to 810 to 1350 lumens/m^2.**

Interest in interior plantings has resulted in increased use of tropical trees in homes, apartments, offices and commercial areas. However, increased utilization has demonstrated that relatively little is known about the factors responsible for properly acclimatizing plants for interior use.

Acclimatization of tropical foliage plants has been aimed at converting sun-grown plants to shade plants adaptable to interior low light situations. Conklin (1) developed a system of "preacclimatizing" plants grown for interior landscapes, and found that plants held for 2 months or more in heavily shaded greenhouses on reduced watering schedules showed reduced loss in quality when moved to building interiors. Conover and Poole (2) found that decreasing acclimatization light intensities from a maximum of 129,000 to 27,000 lumens/m^2 (L/m^2) for 12 weeks decreased leaf drop of weeping fig subsequently held under 540 L/m^2 8 hrs/day for 10 weeks. Work by Vlahos and Boodley (4) showed no difference in leaf drop of *Fiscus nitida* Thunb. or schefflera when acclimatized for 9 weeks under 39,800 or 19,900 L/m^2 maximum and held under 540 to 1080 L/m^2 for 8 to 10 hrs/day.

Two 4x3x3 factorial experiments in randomized block designs were established Dec. 14, 1972 and terminated 25 weeks later. Treatments included 4 acclimatization periods, none, 5, 10 or 15 weeks; 3 lath shade levels, 0, 40 or 80%; and 3 interior holding light intensities, 270, 810 and 1350 L/m^2 provided by cool-white fluorescent tubes. There were 4 replications of each species.

Plants were grown under full sun in a soil mix of 75% decomposed Florida peat and 25% fine sand at a commercial nursery in south Florida. Fertilization rate was equivalent to 2241 kg N, 986 kg P and 1860 kg K/ha/yr from 14-14-14 Osmocote (N-P_2O_5-K_2O) applied every 4 months, with the last application 2 months prior to initiation of acclimatization. Weeping figs in 12-liter Lerio cans and scheffleras in 16-liter plastic cans were moved to the Research Center on Dec, 13, 1972. No fertilizer was applied during the acclimatization phase or during the interior holding period. Plants were watered once per week during acclimatization and during the interior holding period.

Plants acclimatized for 0, 5, 10, or 15 weeks were moved into holding rooms in Jan., Feb. or April. Light levels under 80% shade were 21,500, 27,000 and 32,300 L/m^2 maximum, respectively, during those months. Plants under interior conditions received the specified light intensity for 12 hr per day, 7 days a week and were maintained at 23°C ± 0.5° with a relative humidity of 50 to 60% for 10 weeks prior to grading. Data collected included 1) plant grade rated on a 1 to 10 scale, where 1 = dead, 5 = acceptable and 10 = excellent quality plant, 2) density of foliage compared to a full-sun check, and rated as % of check and 3) no. of abscissed leaves during the 10-week retention period.

Grade and density were lowest and leaf drop highest on both weeping fig and schefflera that did not receive light conditioning (plants held in full sun), but there was no difference between plants grown under 40 or 80% shade (Table 1). Five weeks of acclimatization was as good as 10 or 15 weeks with both genera (Table 2). Grade and density reductions and leaf drop were still higher than desirable under all treatments, although leaf drop reductions of nearly 100% were obtained where plants were acclimatized

Table 1. Influence of acclimatization shade level on grade, foliage density and leaf drop of schefflera and weeping fig held under interior environments for 10 weeks.

Shade level (%)	Grade[z]	Density[y] (% of check)	Leaf drop[x] (no./plant)
	Schefflera		
0	3.8a[w]	26.4a	42.1a
40	5.9b	37.4b	35.3b
80	5.9b	34.8b	34.3b
	Weeping fig		
0	3.1a	21.6a	370.5a
40	6.1b	36.6b	210.8b
80	6.3b	39.5b	196.6b

[z]Plants were graded on a 1 to 10 scale, where 1 = dead, 5 = acceptable and 10 = excellent quality.

[y]Density was determined by comparison against check plants maintained under full sun = 100%.

[x]Leaflets on schefflera and leaves on weeping fig.

[w]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

Table 2. Influence of acclimatization shade duration on grade, foliage density and leaf drop of schefflera and weeping fig held under interior environments for 10 weeks.

Shade duration (weeks)	Grade[z]	Density[y] (% of check)	Leaf drop[x] (no./plant)
	Schefflera		
0	3.7a[w]	28.0a	41.0a
5	6.1b	34.6b	34.9b
10	5.4b	35.0b	36.0b
15	5.8b	35.3b	36.9b
	Weeping fig		
0	3.3a	20.0a	362.6a
5	6.0bc	41.6c	261.2b
10	5.5b	30.1b	233.2b
15	6.2c	38.6c	180.3b

[z]Plants were graded on a 1 to 10 scale, where 1 = dead, 5 = acceptable and 10 = excellent quality.

[y]Density was determined by comparison against check plants maintained under full sun = 100%.

[x]Leaflets on schefflera and leaves on weeping fig.

[w]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

[1]Received for publication July 18, 1975. Florida Agricultural Experiment Stations Journal Series No. 6003. This work was supported in part by the F. C. Gloeckner Foundation and Horticultural Research Institute.

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Table 3. Influence of interior light levels on light acclimatized foliage plants held indoors for 10 weeks.

Interior light (lumens/m^2)	Grade[z]	Density[y] (% of check)	Leaf drop[x] (no./plant)
	Schefflera		
270	3.9a[w]	23.9a	46.6a
810	5.4b	33.0b	34.0b
1350	6.4c	42.6c	30.5c
	Weeping fig		
270	3.2a	13.3a	311.0a
810	5.5b	32.2b	262.1b
1350	7.2c	52.4c	205.0c

[z]Plants were graded on a 1 to 10 scale, where 1 = dead, 5 = acceptable and 10 = excellent quality.

[y]Density was determined by comparison against check plants maintained under full sun = 100%.

[x]Leaflets on schefflera and leaves on weeping fig.

[w]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

5 weeks or more under 40 or 80% shade. These data are in agreement with those of Vlahos and Boodley (4) where they provided 9 weeks of acclimatization under 19,900 or 39,800 L/m^2.

There was considerable loss of foliage after plants were placed indoors under the lowest light intensity regardless of acclimatization treatment. Neither weeping fig nor schefflera held under 270 L/m^2 were acceptable after 10 weeks indoors. There was a linear increase in grade and density and a linear decrease in leafdrop as light levels were increased to 810 and 1,350 L/m^2 (Table 3). The compensation point appeared to be near 810 L/m^2 for both species when illumination was supplied 12 hr per day 7 days a week. Weeping figs grew very little at 810 L/m^2 but considerable growth occurred at 1350 L/m^2. Some growth occurred on schefflera at 810, but there was much more at 1350 L/m^2. Work by Kofranek (3) showed that 430 to 860 L/m^2 was acceptable for schefflera held indoors under cool white fluorescent lighting supplied 16 hr daily for 4 months.

occurred with increased shade durations or higher shade levels. There was an indication plants might be more acceptable to consumers if grown under such levels rather than just being acclimatized after being grown in full sun. One problem with sun-grown plants that are being acclimatized is part of the foliage is composed of sun leaves and part of shade leaves. Ultimately, the sun leaves abscise first when plants are moved under interior conditions.

Literature Cited

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In vitro Propagation of *Cordyline terminalis* (L.) Kunth.[1]

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Abstract. **Rapid *in vitro* propagation of *Cordyline terminalis* was achieved through the induction and proliferation of shoots of stem explants using a modified Murashige and Skoog medium supplemented with 0.5 ppm of 6-benzylamino purine (BA). No growth regulators were required for rapid rooting of shoots. Plantlets were successfully transplanted to vermiculite under a light mist and reduced light intensity.**

Cordyline terminalis, known as ti in Hawaii, is being increasingly used as potted plants and cut foliage. Although plants can be easily propagated by cuttings, there are insufficient stock plants of most cultivars to meet the current demand. This study was initiated to determine whether ti plants could be increased rapidly *in vitro* so that propagation blocks of sufficient size can be obtained in a short time.

Shoot induction and continued proliferation. The cultivar 'Eugene Andre' was used in all experiments unless indicated otherwise. The basal medium (BM) for all cultures contained the inorganic salts of Murashige and Skoog's formula (1), 0.4 mg/liter thiamine·HCl, 0.5 mg/liter nicotinic acid, 0.5 mg/liter pyridoxine·HCl, 30 g/liter sucrose, and 9 g/liter Bacto-agar. Cultures were grown under continuous light of about 2.1 klx and at 28-30°C.

In the initial culture, the objective was only to obtain an ample stock of aseptically grown plantlets to be used for subsequent experiments; therefore, no growth regulator was added to the BM medium. Stem tips were surface-sterilized for 10 min in 0.5% sodium hypochlorite, sectioned into 0.5 cm lengths, soaked 5 min in 0.25% sodium hypochlorite, rinsed in sterile water, and placed on the media.

When a sufficient number of plantlets was obtained, stem explants 0.5 cm long were prepared and set on test media containing BA or BA + naphthaleneacetic acid (NAA) to determine the growth regulator(s) required for shoot induction (Table 1). For each treatment, 10 replicates were cultured.

The effect of NAA alone was not tested here since previous unpublished experiments had shown that it promoted rapid callus formation (Fig. 1). Minimum callus formation was sought in these cultures because our attempts to induce shoots on callus were unsuccessful.

Since only 1 or 2 shoots emerged from each stem explant of 2 nodes on media with 0.1 ppm BA alone or in combination with NAA, 3 or more shoots per explant were arbitrarily considered as multiple shoot formation (Fig. 2). At 0.5 ppm and above, BA induced multiple shoots. With each increase in BA level, shoot elongation was progressively less until at 5.0 ppm shoots were greatly stunted and swollen with very short, dark green leaves. In addition, BA suppressed callus formation. NAA did not further increase the no. of shoots/explant at each BA level but generally stimulated callus and root formation when combined with 0.1, 0.5, or 1.0 ppm BA. As in previous experiments, shoots did not differentiate from callus. Although NAA promoted root formation, only when it was added to 0.1 ppm BA was an increase in normal roots per explant noticed. With higher BA levels, NAA promoted the formation of abnormal roots which were very short, thick, and

[1]Received for publication April 29, 1975. Journal Series No. 1859 of the Hawaii Agricultural Experiment Station, University of Hawaii, Honolulu, 96822.

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