TABLE 1. EFFECT OF ANTITRANSPIRANT ON FINAL VOLUMES OF BING CHERRY FRUIT (1971)

	Volume on spray day (5/19)	Growth (5/19–6/11)	Volume on Harvest day (6/11)	Increase in final volume
		mm³/fruit		
CONTROL	2500	6088	8588	...
AT (early)	2500	7066*	9566	11.5
SEM±			244	
P <			0.05	
	(6/1)	(6/1–6/11)		
CONTROL	7500	1163	8663	...
AT (late)	7500	2462*	9962	15.0
Pooled Std. Dev. ±			966	
P <			0.001	

* Adjusted for prespray variation in growth rate from that of the control.

TABLE 2. EFFECT OF ANTITRANSPIRANT ON BING CHERRY DRY WEIGHT, SOLUBLE SOLIDS, AND MOISTURE CONTENT AT HARVEST (6/11/71)

	Days before harvest	Dry weight (Grams/30 fruit)	Dry weight %	Soluble solids*	Moisture content – fw basis†
	No.			%	%
CONTROL	...	46.9	100	17.1	81.6
AT (early)	22	39.5	84	14.0	84.9
AT (late)‡	10	45.7	98	15.1	83.5

* Measured at 1000–1430 h on 6/11.
† Samples collected at 1600 h on 6/11.
‡ Treatments were significantly different ($P < 0.01$).

diameters were then converted to volumes, assuming the fruit to be a sphere.

Earlier experiments on other fruit crops provided ample evidence that an antitranspirant spray, applied to the stomata-bearing surfaces (underside) of leaves to form a film, greatly increases resistance to escape of water from the leaves, raising their water potential and improving the water status of the tree as a whole. This can enhance fruit growth rate.

Effects on fruit growth

The effect of the "early" antitranspirant spray is shown in graph 1. Before the spraying, all of the fruit grew at the same rate. After spraying, the fruit on the "early" treated trees enlarged more slowly than fruit on control trees until about one week before harvest. Then the treated fruit greatly exceeded the controls in growth rate, with the result that they were larger than controls on harvest day.

The "late" spray (graph 2), in contrast, enhanced growth rate immediately, so that by harvest these fruit were considerably larger than the controls. From graphs 1 and 2 it can be concluded that applying an antitranspirant too early (about three weeks before harvest) can interfere with fruit growth because of the importance of photosynthesis at this stage. Applying an antitranspirant later (about 10 days before harvest), however, results in increased fruit growth because sizing at this stage is more dependent on maximum plant-water potential than upon the accumulation of photosynthates.

Plant water

Even so, graph 1 shows the importance of plant water potential in the later stages of development. Unlike the controls, the growth curves of fruit from treated trees had not flattened off by June 11. This suggests that the antitranspirant may delay maturity, which could be important for staggering the harvest.

Since the rates of fruit growth prior to spraying were the same for all of the trees, it is safe to assume, for simplicity, that all fruit on the two respective spray days were the same size, i.e., 2500 mm^3 on May 19 and 7500 mm^3 on June 1. The volume growth per fruit between spraying and harvest, and the final volumes on harvest day are shown in table 1. The early and late antitranspirant applications increased final fruit volume by 11.5 and 15%, respectively.

As expected, the early spray reduced fruit dry weight, by about 16% (table 2). Both treatments reduced soluble solids slightly, but since this is a refractometric determination, the lower values for antitranspirant treatments may be partly due to a dilution effect caused by the higher moisture contents of treated fruit.

Postharvest effects

Since antitranspirant sprays are still under experimentation for fruit sizing, no recommendations can be made. The wax film on the cherry fruit does not improve its appearance, but it could possibly be buffed off after harvest. One advantage in the persistence of the film on the fruit after harvest is that it reduces postharvest desiccation by as much as 50%. This would help maintain plump fruit during shipment and marketing.

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ORNAMEN

. . . *influences*

SEEDLINGS AND SMALL PLANTS are often maintained in small pots under reduced or low nutritional levels to prevent rapid growth. The rationale for this practice is to prolong marketability of the small plants. The argument goes that too rapid growth results in the plants becoming excessively pot bound or "overgrown" quickly, thus reducing the market life of the plants. It is further argued that reduced nutrition does not influence subsequent growth rate.

Observations

Observations seem to substantiate this contention: excessively pot bound plants grow at a slower rate than plants not pot bound when subsequently transplanted into larger containers or into the field. This effect has been reported even when root pruning and other techniques were used to alleviate the "pot bound" condition. This reaction has not, however, been demonstrated for all plant species.

Transplant timing

To further study the problem, and to begin to develop data on optimum time for transplanting, two tree species—*Eucalyptus viminalis* and *Jacaranda acutifolia*—were selected. The influence of fertility level, duration in small, hard-wall (2¼ inch clay) pots, and pruning of roots at transplanting on subsequent growth of the plants was studied. Two fertility levels were tested: no fertilizer and a moderate fertility level sufficient for sustained plant growth. At transplanting to 1-gallon containers, the roots of some plants were pruned by cutting all roots on the surface of the root ball.

The experiment was conducted during the fall, winter and spring. Growth of the jacaranda plants was restricted because of the naturally short photoperiods of that time of the year. Thus the data

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on subsequent plant growth

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for the first transplanting of this plant reflect plant growth after a long dormant period.

Increase of the height of the plants was used as a measure of growth. All plants were measured at weekly intervals.

Jacaranda

Following the first transplanting, very little top growth occurred for plants in all treatments for 12 to 15 weeks, from December 23 to approximately the first of April. Then growth began at a rapid rate, the tops reaching approximately 40 inches in six weeks. The plants whose *roots were pruned outperformed* the others. This was the only instance where this was true. The initial fertilizer level did not influence subsequent growth, probably because the plants were in small pots for only three weeks and the fertilization did not become effective.

The plants in the second and third transplanting series began growth as soon as transplanted. Data was collected for 20 weeks after transplanting.

Plants held 167 days in small pots did not grow as tall as those transplanted in 81 days. The initial rate of growth was nearly the same. However, the later transplanted plants began to grow at a slower rate after the 15th week compared to those transplanted earlier.

Plants that had been adequately fertilized in the small pots grew more than those that were not. This effect was more notable with the last transplanting where the fertilized plants were 39 per cent taller. The difference at the earlier transplanting was 16 per cent. The effect of the nutrition of the small plant was slow growth for the first few weeks following transplanting. Later growth rate (later than 10 weeks) was close to the same.

Root pruning at transplanting resulted in smaller plants at the end of 20 weeks. This was more notable when the fertility level of the small plants was low. A difference of 21 per cent in height for the low nutrition plants compared to 4 per cent difference for the plants that received adequate fertilizer was noted. Root pruning restricted growth for the first 5 to 10 weeks following transplanting. Then the plants grew as vigorously as the unpruned plants. These data on average elongation will illustrate the effect of root pruning and fertility level.

EFFECTS OF ROOT PRUNING AND FERTILIZATION ON AVERAGE ELONGATION OF JACARANDA PLANTS

	Weeks from transplanting			
	0–5	6–10	11–15	16–21
	cm	cm	cm	cm
No fertilizer				
root pruned	3.0	16.0	36.8	43.0
not root pruned	0.8	9.0	32.0	49.0
Adequate fertilizer				
root pruned	7.3	20.3	39.0	47.5
not root pruned	6.2	21.8	41.5	42.0

Eucalyptus

Growth of the eucalyptus plants was not as severely influenced by season as was the growth of the jacaranda plants. The length of time in the small pots did influence the amount of growth, however. This effect was more notable when the small plants were well fertilized. At the earliest transplanting, the fertilizer effect was not noted. Reduction of growth was evident for the later transplanting. At the low fertilization level, between the first and last transplanting there was a 13 per cent reduction in plant height after 20 weeks of growth. For the high fertility level there was a 28 per cent reduction.

Root pruning did not overcome the effect of the time the seedlings were in small pots. Plants that were root pruned at transplanting were shorter after 20 weeks than similar plants not root pruned. The rate of growth during the first 10 weeks was slower when the plants' roots were pruned. Later growth was as rapid.

Discussion

Both test plants reacted similarly to the treatments. Prolonged periods in small containers adversely influenced subsequent growth following transplanting. The time necessary to reach this state depended upon the species' natural growth rate, and the treatments given the plants. Thus, high levels of fertility hastened the onset of this phenomenon, especially for the eucalyptus that grew more rapidly than the jacaranda.

Pruning of roots resulted in smaller plants. This was a result of a slower rate of growth following transplanting for a period up to 10 weeks. Later growth was as rapid as if the roots were not pruned.

Pruning did not overcome the inhibition of growth induced by prolonged periods in small containers. This growth inhibition thus seems to involve more than mere confinement of roots in a small area.

Ideally plants should be transplanted while they are in rapid growth. In the 1-gallon containers, whatever the treatments applied, growth of eucalyptus showed a marked decrease by the 20th week. The same situation held for the last transplanting of the jacaranda plants. This is the time when growth inhibition factors would begin to become fixed in the plants. One then would expect plants transplanted after the 20th week to grow more slowly than those transplanted before.

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