The Best Treatment Combination for Air Layering Litchis©

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INTRODUCTION

Litchis (*Litchi chinensis*) are a popular tropical fruit in many Asian countries. In the United States, litchis cost $3.99–$7.99 per pound or more depending upon the time of year and the location. Once the litchi tree is established, it can produce 500–1000 pounds of fruit each year, with prime production when it is 20–40 years old. Litchi trees are difficult to propagate. Litchi trees propagated by seed would not have predictable fruit quality because of genetic variation. They would take 10–15 years to set fruit, whereas air layers only take 3–5 years to set fruit. Litchi air layers typically take 3–6 months to root. To find out if roots could be produced more quickly, an experiment was performed on a small litchi orchard at the Calimoya Orchard in Goleta, California in 2005.

MATERIALS AND METHODS

Three factors were considered as main treatments: (1) with or without hormone treatment, (2) type of wrap/covering, and (3) the type of rooting medium.

Hormex 8 was the hormone treatment used to see if it would produce more roots. Hormex 8 has 0.8% indolebutyric acid (IBA). Two types of wraps were used, rooter pot and foil. According to Norman Beard of Beard's Tropical Nursery, rooter pots have these characteristics: easy removal, reusable, stays firmly in place, and the roots can be observed without disturbing the root system. Foil has the characteristics of: ability to form readily, is easy to use, reflects sunlight, and is cheap.

Three types of medium were used: sphagnum moss, peat moss, and coir (coconut fiber). Sphagnum moss is the dehydrated remains of acid-bog plants and has many desirable characteristics including being lightweight, having the ability to absorb 10–20 times its weight, possessing fungistatic properties to inhibit damping-off of seedlings, and a pH of 3.5–4.0 (Hartmann et al., 2002). Peat moss is made up of "remains of aquatic, marsh, bog, or swamp vegetation, preserved under water in a partially decomposed state" (Hartmann et al., 2002). It has high moisture-holding capacity, pH of 3.2–4.5, and small amounts of nitrogen. According to Santha et al. (1999), "coir may be a substitute for peat moss, it has superior water-holding properties than peat moss and is easier to wet." In addition, coir has natural wetting agents and is less acidic than peat moss, with a pH of 4.5–5.5 and a higher salt content with chloride levels of 200–300 ppm whereas most media have 100 ppm of chloride.

The treatments were arranged in 12 sets to give all possible combinations. Each treatment was replicated 5 times to make 60 experimental units. The treatments were as follows:

Table 1. Treatment combination for air layering litchis.

Treatment	Media	Hormex 8	Wrap
1	Sphagnum moss	Yes	Foil
2	Sphagnum moss	No	Foil
3	Sphagnum moss	Yes	Rooter pot
4	Sphagnum moss	No	Rooter pot
5	Peat moss	Yes	Foil
6	Peat moss	No	Foil
7	Peat moss	Yes	Rooter pot
8	Peat moss	No	Rooter pot
9	Coir	Yes	Foil
10	Coir	No	Foil
11	Coir	Yes	Rooter pot
12	Coir	No	Rooter pot

The air layers were performed on a 5-year-old litchi orchard consisting of 19 trees with four cultivars: Brewester, Bengal, Ha-kip, and Mauritius. The branches were girdled on 25 March 2005. One- to three-year-old branches were randomly selected ranging in diameter from ½ to 1 inch. The branches ranged from 15 to 25 inches long. With a pruning knife, a 1- to 1½- inch cut was made about 5 inches above the base of the branch. The bark was peeled off, and with the knife, the cambium layer was scraped off, exposing the xylem. The girdled branches were allowed 3 days to dry out. Meanwhile, the media were soaked in water for 24 h. The coir was leached once to remove some of the chloride.

After 72 h the treatments were applied to the branches. Half the air layers received Hormex 8 powder, applied with a paintbrush, while the other half did not receive any Hormex 8. Half of the experimental units were covered with a rooter pot and the other half were covered with foil. The completed air layers were untouched for 77 days before they were opened and examined for root formation. They were then sealed again and remained on the tree for another 95 days. After 172 days, the air layers were all checked and the ones with roots were cut off for potting.

RESULTS

On 10 June 2005, each air layer was examined for roots. Two air layers were missing; so of the 58 air layers remaining, 19 of them produced roots (Table 2).

Table 2. Rooting results of air layers of *Litchi chinensis* after 77 days.

Number of successful roots	Total possible	Treatment	Rooting (%)	Average root length (inches)	P-Value P-value
11	20	Peat moss	55	3.27	0.032
4	19	Sphagnum moss	21	3.50	
4	19	Coir	21	4.25	0.919
11	29	Hormex 8	38	3.77	
8	29	No Hormex	28	3.50	0.291
13	29	Foil	45	3.77	
6	29	Rooter pot	21	3.50	0.041

Because only 19 of the 58 treatments were successful, a Binary Logistics of Regression test was run on Minitab to show the probability of rooting. There was no difference between treatments with Hormex 8 and those without. There was a difference in the probability of roots between the foil and rooter pot: the foil was two times more likely to have roots than the rooter pot. The Binary Logistics of Regression test showed there was a difference between medium type in the probability of rooting. Peat moss showed it was 5 times more likely to root than sphagnum moss and coir. Sphagnum moss and coir showed no difference in results between each other.

After 172 days, on 15 Sept. 2005, the air layers were examined and potted (Table 3). There were a total of 27 out of 58 air layers that had roots.

Table 3. Rooting results of air layers of *Litchi chinensis* after 172 days.

Number of successful roots	Total possible	Treatment	Rooting (%)	Average root length (inches)	P-Value P-value
11	20	Peat moss	55	7.90	0.420
8	19	Sphagnum moss	42	5.63	
8	19	Coir	42	6.38	0.866
14	29	Hormex 8	48	7.94	
13	29	No Hormex	45	5.66	0.583
16	29	Foil	55	7.49	
8	29	Rooter pot	28	5.74	0.001

Because the number of air layers with roots increased, a Binary Logistics of Regression test was run again. This time there was no difference in the probability of rooting between the hormone treatments used or the type of medium used. Foil covering showed a difference: it did two times better than the rooter pot. A General Linear Model ANOVA Test was run on Minitab to determine the difference in root length between the treatments. Hormone treatment showed a difference in root lengths. Those treated with Hormex 8 had longer roots than those without Hormex 8; the average root length in treatments with Hormex 8 was about 2 inches longer than those without.

CONCLUSIONS

The results showed that there was a difference between the type of wrap/covering used and the type of medium used. Hormone treatment showed no difference in the probability of rooting. However, Hormex 8 did show a difference in root length: those treated with Hormex 8 had longer roots than those without Hormex 8. Treatments with foil were two times more successful than those using the rooter pot. The medium used showed the most difference: peat moss did the best with the longest average root length at 7.9 inches and it had the most successful and consistent treatments of the three. Over half the treatments that received peat moss had roots by Day 77. Peat moss with Hormex 8 in foil proved to be the best treatment combination for air layering litchis in California.

LITERATURE CITED

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Propagation of *Arbutus* 'Marina' by Air-Layering©

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INTRODUCTION

Arbutus 'Marina' is a strikingly attractive California-hybridized shrub grown and sold in nurseries, often pruned into multitrunk or standard form. The appearance of 'Marina' is evocative of the madrone (*A. menziesii*), a powerfully beautiful California native tree. Unlike the madrone, the 'Marina' fits a wide range of landscaping needs and is resilient to most human care. While the madrone is not as adaptable as the 'Marina' and rarely survives outside of its native environment, the 'Marina' can survive in good- or poor-quality soil, in a xeriscape, or in the middle of an irrigated lawn used as a small tree or screening shrub and is a viable option for those who want to echo the California native landscape in their own landscapes.

The higher cost and limited availability of the 'Marina' is primarily because it is recalcitrant to propagation by seed and cuttings. The 'Marina' is available to growers from specialty propagators as micropropagated plantlets, liners from micropropagated plantets, and liners from cuttings. From our experience, the cost is from $1.25 to $1.75 per liner, and the time necessary for liners to reach a saleable 1-gal size is from 6 to 9 months. Local retail and wholesale nurseries routinely find themselves unable to meet the demand for finished 'Marina' standards, multitrunks, and shrubs.

Propagation by air-layering has been successfully used to reproduce species that are not readily propagated by seed or cutting. Air-layering techniques have subtle variations, but in general an incision or wound is made on a plant stem, the bark is removed, a rooting hormone is applied, the stem at the incision is covered by a wad of moisture-retaining material (such as sphagnum moss or rooting rockwool cubes), followed by an occlusive wrap. If the procedure is successful, the plant's natural