PROPAGATION MEDIA FOR FLATS AND FOR DIRECT STICKING: WHAT WORKS?

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Lone Star Growers is a 175 acre wholesale nursery, located in San Antonio, Texas. We are a very diverse operation, with a Color Department growing seasonal flowering crops, a Native Plant Department that is aggressively expanding its production of Texas and Mexican plants, and a container production of woody ornamentals. We sell plants ranging in size from 2¼-in. rose pots to 24-in. boxed trees.

Currently we are growing 350 cultivars of woody ornamental plants. This number does not include the seasonal color or the native plants, which is a significant number more. Of these 350 cultivars, it seems that each one is just a little different in its needs to root and grow.

The Propagation Department at Lone Star Growers consists of 108,000 ft.^{2} of intermittent mist space. We have Biotherm bottom heat on 35,000 ft.^{2} of mist, enabling year-round cutting production.

Our average annual production in propagation is 3.7 million 2¼-in. rose pots and 300,000 4-in. pots. The majority of this is for our own canning purposes. We also grow for liner and 4-in. sales.

We use several methods to root cuttings under intermittent mist:

1. Sticking the cuttings into a standard 16¾-in. × 18-in. × 2½-in. flat with an average of 250 cuttings per flat.
2. Sticking cuttings directly into 2¼-in. rose pots (direct stick)—56 per flat.
3. Direct sticking cuttings into 4-in. pots, 25 per flat.
4. Direct sticking cuttings into 1-gal. containers.

The primary factor determining which method we use is cost. The cost per ft.^{2} to root cuttings in gallon containers in the mist bed is the most expensive. Only 4 gallons per ft.^{2} fit into a bed, compared to 26–2¼ in. rose pots or 120 cuttings in flats. Excluding materials, cost per ft.^{2} of mist space dictates that only a few crops be rooted in gallons. These crops must also produce 95% rooting and be in and out of the mist in 4 to 6 weeks.

Rooting cuttings directly in a 2¼-in. rose pot is my favorite way of propagating ornamentals. The initial cost per sq. ft. of mist space and materials is higher than rooting in flats, and for this reason we must get 80% rooting or better to justify direct sticking. However, when the cutting roots, it is off and growing. No transplant shock or

losses from potting occur for this method so the end result is a better plant and quicker turnover at a savings over potting.

Cuttings rooted in a flat with propagation mix is the least expensive rooting method. We stick 256 cuttings in a 16¾-in. × 18-in. × 2½-in. plastic flat. This method is used primarily to keep the cost down on difficult-to-root crops and when mist space is limited, such as during the winter when we cannot use our outside mist.

The Propagation Department is currently using the following soil mixes:

1. Cutting flat mix: 1 part pulverized pine bark, 1 part coarse perlite, 1 lb./yd.^{3} Micromax, and 4 lbs./yd.^{3} Osmocote 18-6-12

The cutting flat medium is economical and works well for the majority of our cuttings stuck into flats. Most of the crops rooted in flats are the more difficult-to-root species, and we want a very porous medium for these cuttings. We do not use this as our standard mix because it is more expensive and the root ball falls apart easier than in our standard potting mix. It is important to have a medium that holds together when the plant is shifted to a larger container or is planted in the ground. This mix has a total porosity of 60 percent, made up of 25 percent air space, and 36 percent water-holding capacity.

2. Nandina cutting mix: 3 parts pulverized pine bark, 2½ parts peat moss, 2½ parts coarse perlite, 1 lb./yd.^{3} Micromax, and 4 lbs./yd.^{3} Osmocote 18-6-12

This medium is used mainly for nandinas and a few other crops that do better in this mix than in our flat mix. We developed this through trial and error to increase rooting percentage on nandinas. This mix has a porosity of 55 percent, air space 25 percent, water holding capacity 30 percent.

3. Standard potting mix: 7 parts pulverized pine bark, 7 parts large red pine bark, 2 parts coarse builders sand, 1 lb./yd.^{3} Micromax, and 9 lbs./yd.^{3} Osmocote 18-6-12

This mix is used for direct-stick crops and is our potting mix for liners. With the high bark content the potting mix has a pH of 6.5, good porosity and air space. Most of our crops grow well in this mix, which is our main growing mix. Porosity is 53 percent, air space 20 percent, water holding capacity 53 percent.

4. 50/50 bark mix: 1 part pulverized pine bark, 1 part large red pine bark, 1 lb./yd.^{3} Micromax, and 9 lbs./yd.^{3} Osmocote 18-6-12

The 50/50 mix is for direct-stick crops that are more sensitive to decay under the mist. It is a good porous mix; however, after six to eight months it tends to compact, losing some of its air space. The sand in our standard potting mix prevents this compaction. Porosity

is 53 percent, air space 27 percent, water-holding capacity 26 percent.

The availability and low cost of pine bark in Texas makes it a popular component of soil mixes for larger container plants. A lot of bark is used in our propagation soil mixes. The pulverized pine bark has a small particle size with good consistency, and we use it as a substitute for expensive peat moss. We have also found pine bark reduces disease problems from soil-borne pathogens (1). Without incorporating any fungicide our bark mix shows less basal decay of cuttings than other media we have used.

When cuttings of many species are rooted under mist, nutrients can be leached from the cutting. In addition, some media have very low nutritional levels. Various degrees of yellowing or chlorosis occurs, which stresses the cutting, delaying rooting or causing the cutting to die. If the plant does root, it is slow to grow, probably due to nutrition problems. We continually try different fertility treatments during propagation to produce healthy rooted cuttings. A recent trial by our Research and Development Department shows the benefits of fertilizer and microelement additives to various propagation media.

Three propagation mixes were compared, with combinations of Osmocote 18-6-12 and Micromax microelements as additives:

a. Propagation Mix—(perlite: composted bark, 3:1 v/v)
b. Propagation Mix—(plus Osmocote 18-6-12, 9 lbs./cu.^{3})
c. Propagation Mix—(plus Osmocote plus Micromax, 1 lb./cu.^{3})
d. Native Mix—(screened peat: vermiculite: perlite, 3:3:4, v/v)
e. Native Mix—(plus Osmocote as above)
f. Native Mix—(plus Osmocote plus Micromax as above)
g. Fine bark: perlite, 1:1, v/v—(plus Osmocote plus Micromax as above.)

Cuttings of *Lagerstroemia indica* and *Hibiscus rosa-sinensis* were planted in each mix for comparison. Cuttings were placed in the mist and treated as they would be normally for the species. When the cuttings were rooted sufficiently for the individual species, they were evaluated for leaf color and plant heights (Figures 1 and 2).

As evident from the height charts the addition of Osmocote increased growth significantly, and the addition of microelements plus Osmocote produced another growth increase.

When leaf color is compared, it is evident again that the combination of Osmocote and Micromax worked well for us (Table 1). The media with microelements incorporated produced darker green color in cuttings. Cuttings were much healthier and continue to be higher quality plants.

Micronutrients, such as Micromax or other comparable

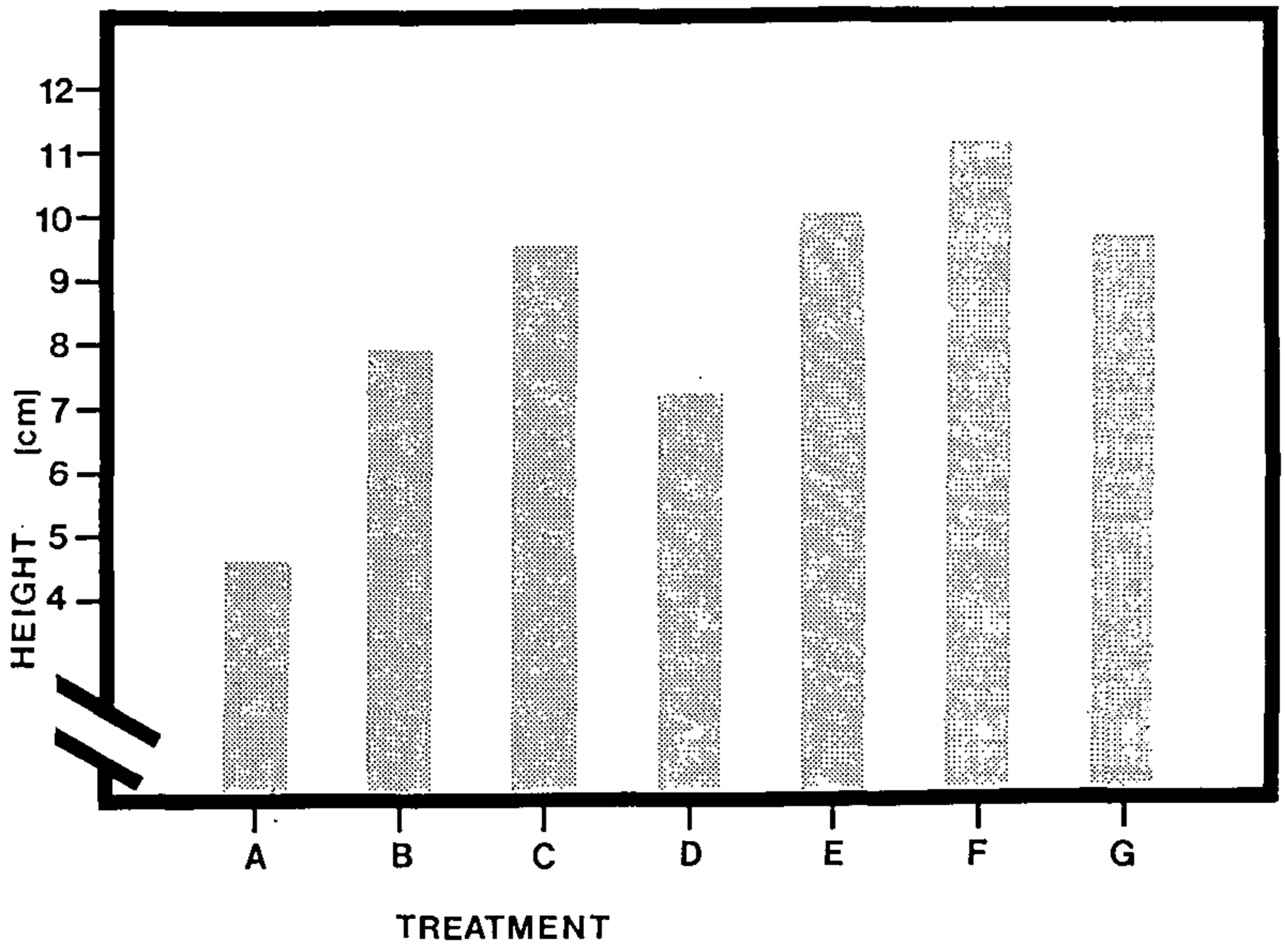

Figure 1. Heights of *Hibiscus* liners using various combinations of media and fertilizers (See text).

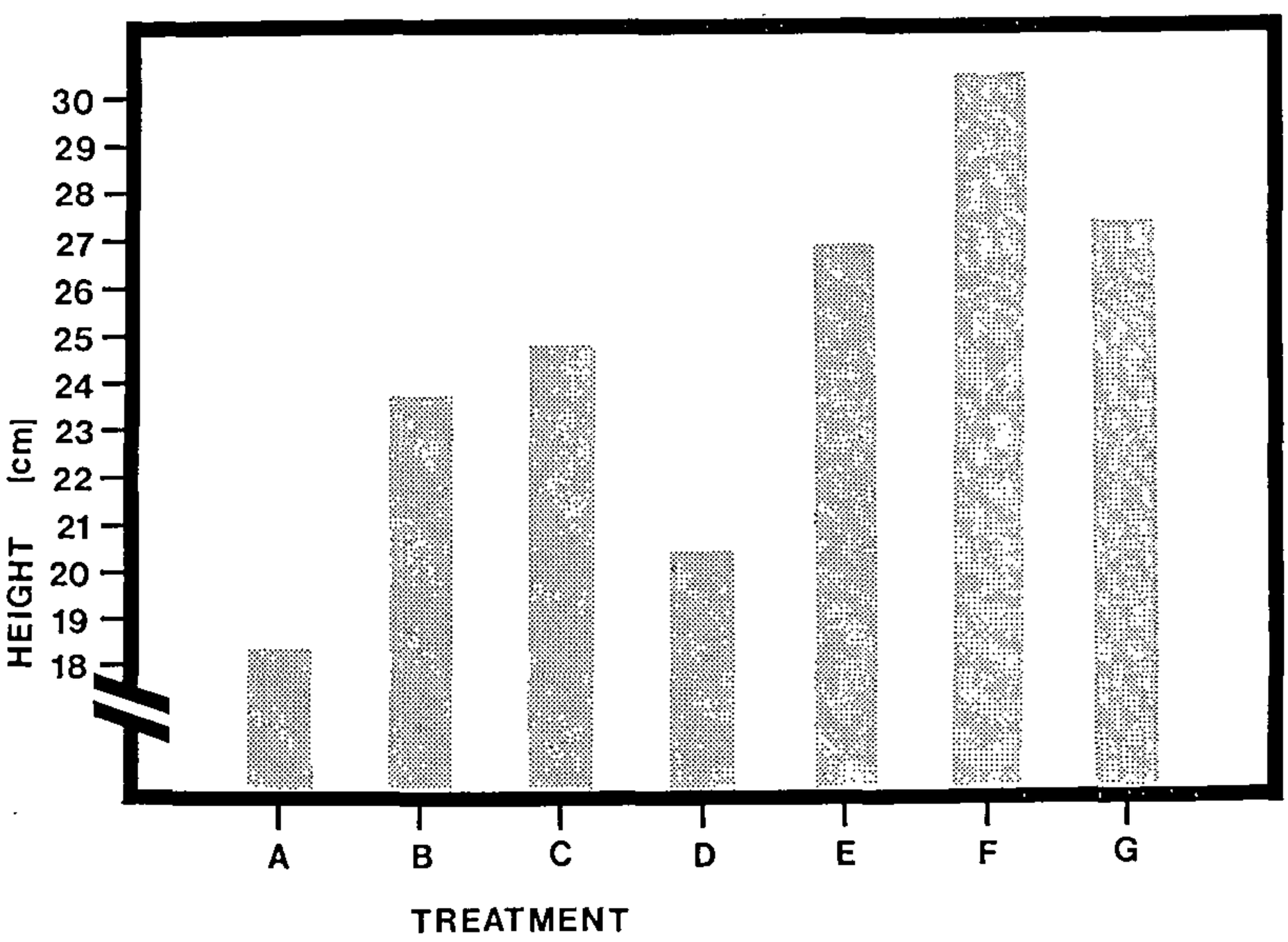

Figure 2. Heights of *Lagerstroemia* liners using various combinations of media and fertilizers. (See text).

Table 1. Quality rating[1] of foliage of *Lagerstroemia* and *Hibiscus rosa-sinensis* plants propagated in seven different propagation mixes.

Treatment (rooting mix) See text	Quality rating	
	Lagerstroemia	*Hibiscus rosa-sinensis*
A	2	2
B	2	2
C	3	4
D	2	3
E	4	4
F	5	5
G	4	5

[1]Quality rating: 1 = worst; 5 = best

materials, incorporated into the mix consistently add vigor and darker green color to the plants grown in the mix. Studies have shown that a plant rooted with microelements in the medium will be more vigorous and desirable throughout the life of the plant. Also, cuttings taken from these same plants will root and grow better than those taken from stock not grown with microelements (2). Lone Star Growers now incorporates microelements into all of its propagation media.

An observation I have made from recent trials and experience is that vermiculite, as part of a growing medium, utilizes nutrients efficiently. Vermiculite has a high cation exchange capacity and could be an important ingredient to any soil in limited amounts (3). We will be doing further trials to find the optimum amount for our mixes and the economics of using vermiculite and other components.

Lone Star Growers is a progressive company. Even though we are growing good quality plants now, we feel that there are better ways to do just about anything. There is no better example of this concept than the propagation area. This is where it all starts. If you want to improve your plant quality, reduce your growing time, and therefore reduce cost, look at your propagation area.

The improvements you make there will be magnified throughout your nursery.

LITERATURE CITED

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