

Thursday Morning, December 10, 1987

The morning session was convened at 8:00 a.m. with Charles Hildebrant serving as moderator.

PLANT PRODUCTION WITH FOG

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Weston Nurseries, Inc. chose to invest in a fog-producing machine for two reasons. First, the lack of labor that we could foresee in our area, and second, the increased greenhouse space being used due to our expanding tissue culture lab.

By using fog in conjunction with direct-sticking of softwood cuttings into flats, production time has decreased, two greenhouses that were vacant all summer long are now being used for propagation, and rooting plants with which I had difficulty are much easier to propagate.

After a couple of years of experimenting with fog propagation, I am currently using fog in three ways. First, fog is used for propagating easy to root plants to decrease production time. Second, it is used for rooting plants that do not overwinter very well if their root systems are disturbed after rooting. Thirdly, fog is used for experimenting with plants that I have had little or no success with by other means.

Four different media types have been tried at Weston Nurseries.

- 1) Washed concrete sand and coarse perlite (9:1, v/v). This medium is heavy and workers dislike moving the flats. One has to water this medium often during the summer. Cuttings, however, root quickly with high percentages. The water holding capacity is very low. After rooting has occurred, constant attention must be given to the plants because the medium quickly dries out.
- 2) Composted Southern pine bark, washed concrete sand, and coarse perlite (3:2:1, v/v/v). This medium is heavy and workers dislike moving the flats. Rooting percentages, however, are high. It is easy to overwinter the rooted cuttings. In the spring the medium has to be watered daily.
- 3) Peat moss and coarse perlite (1:1, v/v). This medium is easy to handle, and light weight. Cuttings root and overwinter well. Cuttings of some cultivars decay in it, however.

- 4) Peat moss and coarse perlite, and composted Southern pine bark. This medium is easy to handle, and light weight. Plants overwinter well in it. Decay of cuttings has not been a problem.

Three of these media are currently being used. The washed concrete sand and coarse perlite medium is used on *Syringa vulgaris* cultivars, *Metasequoia glyptostroboides*, *Cornus florida* 'Rubra,' *Hamamelis mollis*, 'Brevipetala' and *Stewartia pseudocamellia*. Deciduous azaleas root well in the peat moss, coarse perlite, composted Southern pine bark medium. For the remainder of our cuttings the peat moss and coarse perlite medium is used.

The containers for rooting vary with the type of plants being propagated. The container used most is the shallow galvanized Norman flats. They seem to be very durable, the easiest to clean, and take up a relatively small space when not being used.

Rooting hormones are either Dip 'N Gro 1:10 or an 0.8% IBA talc formulation.

The rooting structure is quite simple. It is an inflated hoop tent with two layers of clear polyethylene. For shade 63% Armex black polypropylene shade cloth is placed over the plastic on the outsides of the greenhouses. The rooting containers are placed on the floor or

Table 1. Rooting percentages of bench propagated vs. fog direct-stick cuttings.

Plant	5 yr avg Bench propagated	2 yr avg Fog direct-stick
<i>Berberis thunbergii</i> cultivars*	90%	0%
<i>Buddleia davidii</i> cultivars	99	100
<i>Cornus florida</i> 'Rubra'*	70	98
<i>C. stolonifera</i> , 'Flaviramea'	99	100
<i>Calluna vulgaris</i> 'Crispa'*	80	100
<i>Chaenomeles speciosa</i> cultivars	95	100
<i>Deutzia</i> cultivars	99	100
<i>Hamamelis mollis</i> 'Brevipetala'	80	98
<i>Hibiscus syriacus</i> cultivars	100	100
<i>Hydrangea</i> cultivars	90	98
evergreen azaleas*	90	95
<i>Kalmia angustifolia</i> 'Alba'*	20	98
<i>Metasequoia glyptostroboides</i> *	30	95
<i>Parthenocissus</i> cultivars*	99	100
<i>Rhododendron</i> 'Lemon Drop'	95	99
<i>R.</i> 'Pink & Sweet'	90	100
<i>Stewartia pseudocamellia</i> *	75	95
<i>Spiraea</i> × <i>bumalda</i> 'Anthony Waterer'	100	100
<i>Symphoricarpos</i> cultivars	100	100
<i>Syringa potaninii</i> *	40	75
<i>Syringa vulgaris</i> 'Ludwig Spaeth'	66	72
<i>Vaccinium corymbosum</i> cultivars	75	0
<i>Viburnum plicatum</i> f. <i>tomentosum</i> cultivars	90	99

*Rooted in the 90 to 95°F greenhouse

on wood benches. Decay is not a problem and no fungicides are needed. The cuttings are either healthy and green, and root; or turn brown after 2 to 3 days and decay.

The environment in which the cuttings are rooted varies in the two greenhouses. One greenhouse has a 16 ft tall ceiling and the fog nozzles are mounted 10 ft above the floor. The air temperature above the rooting cuttings rarely gets above 80°F during summer days. The other greenhouse is a conventional 22 × 96 ft hoop house. The fog nozzles are one foot from the flats and the air temperature stays between 90 and 95°F on sunny summer days. The cooler greenhouse is filled first and then cuttings are placed in the hotter greenhouse. Both houses remain at or above 90% humidity during the rooting period. No additional heat is used in either greenhouse.

The rooted cuttings are hardened off when the root ball is about ¾ in. (2 cm.) in diameter. Gradually, the humidity is lowered in the greenhouses until the plants do not need fog to survive. The cuttings from the 16 ft tall greenhouse, once hardened, must be moved to

Table 2. Conventional bench-propagated vs direct-stick fog for evergreen azaleas (cost/unit at \$10.00/hr*).

Step	Man-Hours	Cost
BENCH PROPAGATED		
Field Cuttings	16.25	162.50
Media/bench preparation	40.00	400.00
Sticking	39.00	390.00
Flatting	58.50	585.00
Flats moved to winter storage	7.00	70.00
Mist setting/observation	3.00	30.00
Pesticide application	0.5	5.00
Materials:		
14 bags peat moss		80.50
14 bags coarse perlite		102.90
2 gal. Clorox bleach		2.00
1 lb benomyl		18.00
	Total	\$1845.90
		\$1845.90/17044 cuttings = 10.8¢/cutting
FOG DIRECT-STICK		
Field cuttings	16.25	162.50
Media preparation	17.00	170.00
Sticking	39.00	390.00
Maintenance of nozzles/observation	2.80	28.00
Materials:		
14 bags peat moss		80.50
14 bags perlite		102.90
10 Lb Aqua-Gro		22.00
2 gal. Clorox bleach		2.00
	Total	\$957.90
		\$957.90/17044 cuttings = 5.6¢/cutting

*Average total labor cost to the nursery in propagation

other winter holding houses. This greenhouse must be empty for different uses throughout the winter. In the 22 × 96 ft. greenhouse the rooted cuttings remain at 40 to 45°F until spring when they are either planted in raised beds or containerized.

Although there is little increase in rooting percentages among the many plants tried (Table 1), significant savings are possible with this method (Table 2), because production steps are reduced by direct sticking cuttings (Table 3). At Weston Nurseries man-hours are reduced by 48% when fog is combined with direct sticking of cuttings (Table 3).

Table 3. Cutting production steps at Weston Nurseries, Inc. for conventional bench propagated vs direct-stick fog methods.

Bench propagated	Fog direct-stick
1. Remove used media from benches	1. Clorox 1:9 flats
2. Repair benches	2. Mix media
3. Clorox 1:9 entire greenhouse	3. Fill flats
4. Fill empty benches with media	4. Move flats to fog greenhouse
5. Mix media in benches	5. Stick cuttings
6. Stick cuttings	6. Maintain cuttings
7. Maintain cuttings	
8. Flat rooted cuttings	
9. Move flatted rooted cuttings to harden off	
10. Move rooted cuttings to winter storage	

BRIAN DECKER: What about clogging and algae?

CHRIS ROGERS: We rarely have a problem with either one. The nozzles are checked on a daily basis. If one is clogged I remove it and replace it with an extra. I clean my nozzles with Clorox/H₂O (1:10 v/v) for 1 hour.

BRUCE BRIGGS: How do you keep the temperature from building up on very hot days?

CHRIS ROGERS: In our tall greenhouse the temperature is never above 80°F and the fans do not run. In the 22 × 96 ft greenhouse we just use the Acme fans that are in the greenhouse. I run the temperature a little higher (90 to 95°F) with the lower houses.