Fog and Air Circulation Techniques to propagate *Aesculus parviflora* and Trifoliate Maples

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INTRODUCTION

In the 6 years that our firm has worked with fog propagation, we have undergone a metamorphosis of technologies and techniques. A short explanation of our present system should clarify the factors necessary for the propagation of these very desirable plants—*Aesculus parviflora* and trifoliate maples.

PROPAGATION ENVIRONMENT AND FOG SOURCE

Our present production greenhouses are 30 ft × 60 ft and have a 14 ft height. We find the height extremely important in controlling temperature. It allows the heat to rise away from the cuttings and allows us to maintain the desired humidity within the lower 6 ft of the house. The temperature is often 8 to 10F cooler at the cutting height. The houses are covered with a white 3-year poly as well as a white shade tarp. The white 45% shade lowers our house temperature 5F at the cuttings height when compared to the same 45% shade provided by black shade cloth. These few degrees can become crucial when ambient air temperatures reach 89F and above. At such temperatures, maintaining the desired level of fog becomes difficult if not impossible. Our combined shading equals 70%+ of available sunlight. Many fellow nurserymen have commented that this is "near coal mine conditions". A quick check of propagation references (Dirr and Heuser, 1987) shows that cuttings which are 100% efficient in photosynthesis can use only 10% of the available sunlight at any given time. I have found that the direct rooting of difficult genera in a peat-based soil medium is challenging enough without teaching the cuttings to swim the back stroke due to over watering.

The houses contain a standard mist system using Naan Irrigation, Cerritos, California 327112 nozzles supplying 0.33 gpm at 55 psi water pressure. I should note that a mist system is required to cool the cuttings during hot weather because the fog supplies humidity without large water droplets which can settle from the air. A true fog type propagation system should never be considered a stand alone means for rooting cuttings. A standard time clock is used to deliver 8 to 10 sec of mist every hour from 11 a.m. to 3 p.m. during the propagation period. Our first notion was to utilize a fog system which was both economical and workable with our poor water quality. Although we have a plentiful water source our iron content can exceed 9 ppm. This prohibits any fog system utilizing fine nozzles which would wear excessively without expensive water treatment prior to use. Our experience with the Humidifan by Jaybird Inc., Centre Hall, Pennsylvania, has been good, although the early models exhibited excessive water fallout and wet zones near the fans. We did notice excellent results in temperature control and reduced disease problems due to the high amount of air movement as noted by Milbocker (1980, 1983). Although not inexpensive, the fans and oscillators supply superior fog

movement and air mixing in conjunction with a our present fog nozzle.

Our present fog source is the AlRJET fogging nozzle produced by Spraying Systems, Wheaton, Illinois. The nozzle produces 3.1 gph of atomized water when supplied with 60 psi water pressure and 2.2 scfm of air at 35 psi. The fog droplets are produced by the shearing action of the air source against the water and do not utilize high pressure or fine nozzles as other systems do. The initial recommendations we followed were to use a nozzle for each 130 ft^2 of greenhouse space to be humidified. Sets of nozzles need to be zoned so that the volume of air required can be economically supplied. Although the system utilizes low pressure, a high volume air source is necessary. A 30 ft × 80 ft house as described previously can be operated by a single stage 2-hp compressor which will run almost constantly. This constant load will be a strain on the compressor, although the lack of on-off cycling will enhance the life of the electric motor. Large compressor units of high horse power as well as direct drive units are not recommended for this reason. A large volume storage tank of 100 gal+ will eliminate surging in the air supply. A second compressor, as a back up, will eliminate propagator anxiety.

The fog is controlled by a time clock opening the valves feeding both air and water at the same time. A humidistat was used at first but was found to keep the cuttings to "happy". During our first attempts we were throwing out cuttings with 2 to 3 in. of new growth and no rooting. I feel a slightly stressed cutting roots faster and better than our first pampered attempts. Humidity is controlled at about 75% to 80% from 9 a.m. to 7 p.m. during propagation. The fog is increased as flagging becomes apparent with a normal 85F sunny day clock setting of 2 min on time per 8 min. The houses are not vented and the humidifans are on to circulate air within the house during all daylight hours and 45 min to 1 h after dusk.

PLANTS UNDER PRODUCTION AND PROPAGATION PROCEDURE

Aesculus parviflora
A. parviflora f. *serotina*
A. parviflora 'Rogers'

Timing: Cuttings taken 5 June to 4 July (Chicago) when there is 10 in. to 2 ft of new growth on stock plants. Sucker growth or terminal growth from older wood—both root; however, sucker growth will root faster.

Preparation: Cuttings are taken in the field and then prepared at the farm prior to sticking. New wood of 18 to 24 in. is removed and bundled using rubberbands. If a long period may elapse prior to cleaning, the cuttings are iced in transport and held in loose bundles under refrigeration. Leafy single node cuttings with 1 in.+ of stem tissue and two leaves are used. Leaves are cut to 1/2 to 1/3 of original size to allow placing more cuttings in trays. Tip cuttings are made with the terminal shoot left intact. A clean basal cut is made on all cuttings with a pruner.

Fungicide: Zyban dip and allow to dry.

Hormone: Woods 1 : 8 (1 : 5 if wood is hardening) (v/v)

Medium: Containers are Growing Systems Inc. Milwaukee, Wisconsin, 38-deep tube trays 2-1/4 in. × 5-3/4 in. prefilled with Fison Sunshine Mix #1 cut 35% with coarse perlite and prewet prior to sticking. Trays are placed on the greenhouse

floor on a pea gravel base. Cuttings are inserted with buds set at or below soil line.

Results. We have not found cutting age to be extremely important in rooting success. Sucker cuttings will root in 10 to 15 days and older growth will take 10 to 20 days longer at the minimum. **The cuttings will not root under wet soil conditions.** Cool temperatures and/or late sticking (20 June +) will lengthen the rooting time up to 5 weeks. A 70% rooting rate can be achieved with a higher success obtainable if sucker cuttings alone are used. Once the cuttings are rooted they must be potted or weaned from the fog to retain good foliage. We have rooted 2000 to 3000 plants for several years using this system.

Aftercare: We find it necessary to repot the plants to 1-gal containers to keep the plants in active growth. Plants 18 to 24 in. can be grown in a single season in this manor. All plants are held a 32F during the first winter.

Acer griseum
A. maximowiczianum [syn. A nikoense]
A. maximowiczianum × *A. griseum,* Rochester hybrid
A. mandshuricum
A. triflorum

Timing: June 1st to 12th (Chicago) after 6 to 10 in. new growth three nodes produced. No terminal growth is removed. We stick a one- to three-node cutting 1-1/2 in. to 7 in. long, depending on cutting availability. Wood is from sources with ages of: *A. triflorum*, 42 years; *A. maximowiczianum*, 20 years; *A. mandsuricum*, 4 years;*A. griseum* 4 to 23 years.*Acer griseum* appears to require juvenile wood to obtain higher rooting percentages when compared to the other species listed.

Preparation: Cuttings are field cleaned and bundled. The bottom two leaves are removed. A clean basal cut is made with a pruner. Fungicide, medium, and container used are as with *Aesculus*.

Hormone: Woods 1 : 5 (1 : 3 older wood) (v/v).

Results: Rooting percentages with 2- to 5-year-old stock plants average in excess of 75%.*Acer triflorum* as old as 45 years rooted 70% plus in two attempts with 1000 cuttings each on 2-successive years. With the exception of*A. griseum* the hardness of the cutting seemed far more important than stock plant age as long as vigorous cuttings were available. Young stock plants yield cuttings that can root in as little as 20 days. Older cutting sources can cause cuttings to take as long as 6 weeks to root. We are presently rooting from 500 to 2100 plants of each of the above trifoliate maples. Cuttings are overwintered in their rooting container and held at 32F until spring. **We have found all species with the exception of *A. griseum* to be severely prone to verticillium root rots. A well drained growing on mix is essential.**

LITERATURE CITED

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