Seed Cleaning©

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My tool for today is using the kitchen cuisinart for *Sambucus* seed cleaning. We collect our *Sambucus* seed in the wild at site-specific locations throughout California. When we get the berries back to the nursery the first step in the seed cleaning process is to take the berries off the stems. When we have the berries off the stems we add them to the cuisinart, depending on how juicy the berries are we may or may not need to add water.

We run the cuisinart for about 1 minute until we have a puree of berries. Next we add the puree to an empty bucket and slowly add water. The viable seeds sink to the bottom of the bucket while the voided seeds and pulp float to the top. We keep adding water until we are left with clean seeds at the bottom of the bucket. The reason why we take the berries off the stems is because the cuisinart chops the stems up into little pieces and they sink to the bottom with the clean seed. We then drain the water and place the seeds on newspaper to dry. Because of our cleaning of the seed we can store the seed in a refrigerator for 6 to 8 years without mold problems. Our *Sambucus* seed take a 3-month stratification and we have found that the cleaner the seed is the less chance of mold and rotting we have during stratification. Thank you for letting me take the time to share with you today.

Rooting Softwood Cuttings Collected from Forced Large Stems of Oakleaf Hydrangea and American Chestnut©

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Softwood shoots were forced from large stem segments of oakleaf hydrangea and American chestnut under intermittent mist. The softwood shoots were used as stem cuttings. Oakleaf hydrangea cuttings rooted >80% with or without auxin and forced shoots rooted better than similar cuttings collected from plants growing outdoors. Two American chestnut forced softwood cuttings rooted. The original stem segments tended to show symptoms of chestnut blight under mist.

INTRODUCTION

Hydrangea quercifolia Bartr. (oakleaf hydrangea) is a beautiful plant in the landscape with its large oak-shaped leaves and interesting white flowers. It is considered to be difficult to root (Dirr and Heuser, 1987; Young and Young, 1992). Cultivars are propagated by softwood cuttings or root cuttings.

Castanea dentata Marsh. (American chestnut) was once a dominant, wide-ranging, and valuable tree in eastern North American forests. However, in the early 1900s the species was decimated by chestnut blight (*Cryphonectria parasitica* [Murrill] Barr), which kills above-ground portions of trees. Decades of breeding research has resulted in the potential for the restoration of resistant chestnut to forests in coming years. However, there is no established protocol for vegetatively propagating the species. Like other members of the family *Fagaceae*, American chestnut cuttings are difficult to root (Zaczek et al., 1997).

We have been forcing softwood shoots from large stem segments of woody plants since 1995 (Henry and Preece, 1997a, 1997b, Van Sambeek and Preece, 1999). These shoots can be used for cuttings or as a source of explants for micropropagation. We were interested in how the forcing technique would apply to the vegetative propagation of these two native species.

Our objectives were to: (1) determine whether shoots could be forced from dormant stem segments and, if so, (2) determine whether they could be rooted.

MATERIALS AND METHODS

Oakleaf Hydrangea. The largest stems were removed near the base of the plant and cut into 38 to 40 cm long segments, then the lower half was inserted horizontally into flats filled with perlite. Softwood shoots were forced under intermittent mist (6 sec every 6 min during daylight hours). Softwood cuttings (3 to 10 cm long) were collected from the stem segments and outdoor plants and the bottom 2 cm of each shoot was dipped in 0, 1000, 5000, or 10,000 mg·liter^{-1} potassium salt of indolebutryic acid (KIBA) before being placed into a vermiculite and perlite (1 : 1, v/v) medium under intermittent mist. This experiment was arranged in a completely randomized design with three single cutting replications of each treatment per run. The experiment was conducted six times.

American Chestnut. Five American chestnut trees without visible signs of chestnut blight ranging in diameter at breast height from 7 to 13 cm and 4 to 8 m tall were collected in Huntingdon County, Pennsylvania on 11 Dec. 2000. Other trees of similar sizes or larger that were in the area had evidence of infection by blight. Collected trees had arisen from stumps whose above ground boles had been previously killed by the blight so they were not purported to be resistant. Stems were cut into sections 50 cm long with a minimum diameter of 2 cm, labeled by tree and section position, and kept cool and moist until placement under mist. On 18 Dec., sections were randomly placed on a bed of perlite on a bench under mist (12 sec every 6 min) in a greenhouse.

On 19 Feb. 2001, vigorous shoots arising from the stem sections at least 7 cm long with fully formed leaves were collected as cuttings noting tree and section position. The basal 2 cm of cuttings were stripped of leaves and dipped for 5 sec. in a 5000 ppm solution of KIBA and water and allowed to dry. Cuttings were then inserted 2 cm deep into Leach cells filled with perlite and placed under mist. At this time, there was some necrosis of leaves on shoots that were arising from the stem sections.

Stem sections were examined 2 weeks later in an attempt to collect more cuttings. There were approximately 80 additional shoots and more buds beginning to break. However, shoots that were developing on many of the sections showed signs of necrosis and were not collected. Upon examination of the stem segments, 48% appeared to be infected with chestnut blight as evidenced by orange fruiting structures erupting from the bark. At least one section from each tree was apparently infected.

By 9 April the majority of cuttings had died or were in poor condition. Cuttings were examined on 15 June for the evidence of rooting.

RESULTS AND DISCUSSION

Oakleaf Hydrangea. There was a mean of 11.5 softwood shoots per stem segment over a 6-month period from March to September. The softwood shoots had a mean length of 5.7 cm. Softwood cuttings rooted at least 80% regardless of whether they were treated with KIBA or not. When the cuttings were treated with 10,000 $mg \cdot liter^{-1}$ KIBA, significantly fewer long roots (> 2 cm long) and more short roots (0.5 to 0.9 cm long) formed than on the control cuttings. This was consistent with an auxin overdose effect.

Across all auxin treatments, forced softwood cuttings rooted at 85% and those collected from outdoor plants rooted at 82%. The forced softwood shoots had significantly more long roots (≥ 1.5 cm long) and more total roots (11.6 roots per cutting) than the softwood cuttings collected from outdoor plants (9.4 roots per cutting). Therefore, forced softwood shoots rooted better than similar shoots collected from plants grown outdoors. The reasons for this difference may relate to rejuvenation of forced shoots and the fact that since they were forced under the same environment in which they were rooted, they may be more adapted to the mist.

American Chestnut. Trees produced from 0 to 27 shoots, depending on genotype (Table 1). Trees tended to produce more shoots from the more basal (and larger in diameter) sections. Two of the 56 cuttings rooted. One rooted cutting arose from the most basal section of one tree and one from the next section up from the ground from a second tree. This suggests that shoots forced from more basal sections may be more juvenile and more easily rooted.

Table 1. The number of cuttings forced and subsequently rooted and incidence of fungal infection from five sectioned American chestnut trees.

Tree number	50-cm sections (no.)	Cuttings forced (no.)	Cuttings rooted	Sections with fungal fruiting (no.)
2	11	27	1	6
3	12	25	1	11
4	8	0	0	2
5	6	1	0	1
6	7	13	0	1
Total	44	66	2	21

CONCLUSIONS

Oakleaf Hydrangea. Epicormic softwood shoots force easily over an extended time and can be excised and rooted in high percentages. These forced shoots will produce more roots than similar cuttings taken from outdoor plants. The season of production of softwood cuttings from forced stems is much longer than from plants growing outdoors. In our studies, little was gained from applying auxin to softwood cuttings of oakleaf hydrangea.

American Chestnut. American chestnut shoots can be forced from dormant stem segments and some cuttings do have the capacity to root. The forcing environment under intermittent mist appears ideal for development of chestnut blight symptoms. Appropriate fungicides should be used to generate larger numbers of shoots and cuttings for rooting.

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