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STOCKPLANT ETIOLATION AND BANDING FOR SOFTWOOD CUTTING PROPAGATION: WORKING TOWARDS COMMERCIAL APPLICATION

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Abstract. The technique of stockplant etiolation has made it possible to root cuttings of plants which previously could only be propagated by budding or grown from seed. The cost of producing rooted cuttings from etiolated stockplants is approximately $0.05 to 0.10 more per cutting than traditional cutting procedures. The practice of field etiolation can produce a finished plant in the same time as field budding. Greenhouse etiolation substantially decreases the time required to produce a finished plant.

REVIEW OF BASIC TECHNIQUE

The technique of etiolating stockplants prior to cutting propagation has been shown to yield markedly improved rooting percentages for plants previously considered difficult-to-root (1). Etiolation means growing plants in the absence of light or in very heavy shade as the term is commonly used in cutting propagation. The basic method involves covering dormant stockplants with black shade cloth when the buds are beginning to swell. Typically, greater than 90% shade is used because it is not necessary to achieve

100% darkness. In fact, a totally enclosed shading structure is detrimental as it would allow too much heat to build up under the shade on sunny days. Some ventilation, such as opening the corners or making cuts in the fabric near the top, is necessary to reduce heat build-up.

After the new growth has reached approximately 2 to 3 in. (5 to 7 cm), a 1-in. (2.5-cm) square band of black velcro whose "wool" and "hooks" have been dipped in an 0.8% indole butyric acid (IBA) talc preparation (Hormodin No. 3) is pressed onto the base of the new growth (the future cutting base), so that the velcro band cannot slide up or down the stem. The new stem is in fact sandwiched between the wool and hooks of the velcro. At this time, the shade cloth is removed gradually over the period of one week so as not to burn the tender etiolated shoots. The band remains on the new shoot for 4 weeks while the top of the shoot is allowed to turn green. After 4 weeks, the shoot is cut right below the band, and the band is removed revealing a still etiolated cutting base which has swollen in response to the IBA treatment. The cutting is then stripped of lower leaves, if necessary, treated again with the same hormone preparation (Hormodin No. 3) and rooted under mist. All deciduous cuttings treated in this way rooted in 4 weeks; some as early as two. Pines, however, took 12 weeks to root. With *Betula* and *Carpinus* species, roots had already begun to form under the velcro bands while shoots were still attached to the stockplant.

Banding on its own without prior etiolation has also proved to be a very effective root promoting treatment. With this treatment, stockplants are allowed to produce 2 to 3 in. shoots and then velcro bands with hormone are applied to the bases of the new shoots in exactly the same manner as described for the etiolation and banding process. The area under the band loses chlorophyll after banding and so is said to be blanched. Those plants which responded more to etiolation or to banding alone are listed in Table 1.

RESULTS AND DISCUSSION

Etiolation trials with several new species proved successful this year. Shoots from *Chionanthus virginicus* seedlings rooted at 80% while shoots from mature *Pyrus calleryana* plants rooted at 87%, when banded alone. *Carpinus betulus* 'Fastigiata' cuttings from mature trees rooted at 100% when etiolated. *Fagus sylvatica* cvs. rooted between 25% and 84% when etiolated.

Further experimentation with the technique suggests that shoots can be banded at the base (as has been described) or in mid-stem with equal success (2). Using *Betula papyrifera*, stockplant age also interacted with the etiolation effect (Table 2).

Shoots from older stockplants were more difficult to root but responded positively to an etiolation pre-treatment, whereas shoots

Table 1. The best rooting percentages obtained from either etiolated or banded cuttings.

Species	Best rooting %	Treatment type
Acer griseum	50	E*
A. saccharum	86	E
A. platanoides	75	E
Betula papyrifera	100	E
Carpinus betulus	96	E
C. betulus 'Fastigiata'	100	E
Castanea mollissima	100	E
Chionanthus virginicus	80	B
Corylus americana 'Rush'	87	E
Fagus sylvatica	84	E
F. sylvatica 'Atropunicea'	25	B
F. sylvatica 'Laciniata'	84	E
F. sylvatica 'Fastigiata'	44	E
Pinus mugo	64	B
P. sylvestris	92	B
P. strobus	83	B
P. thunbergii	92	B
Pyrus calleryana	87	B
Quercus coccinea	46	E
Q. palustris	64	E
Q. robur	70	B
Q. rubra	50	B
Syringa vulgaris 'Belle de Nancy'	65	E
S. vulgaris 'Charles Joly'	63	E
S. vulgaris 'Charles X'	79	E
S. vulgaris 'Michel Buchner'	83	E
S. vulgaris 'Mme. Lemoine'	83	E
S. vulgaris 'Pres. Grevy'	46	E
Taxus × *media*	100	E

E = etiolation plus banding; B = light-grown, banded shoots.

Table 2. The effect of etiolation, banding, and age of stockplant on percent rooting of *Betula papyrifera* cuttings.[1]

Age of stockplant	Etiolated − band	Etiolated + band	Light grown − band	Light grown + band
1-year old seedlings	71%	100%	51%	65%
4-year old trees	63%	68%	10%	15%

[1]Thirty cuttings per treatment

obtained from seedling stockplants also showed a positive if less dramatic response to the pre-treatment.

COMMERCIAL APPLICATION

If this technique is to become commercially viable, it must be compared with current propagation practices. For shade tree production, budding is the method generally used. Trials are underway in cooperation with Schichtel's Nursery, Orchard Park, N.Y.

which seek to compare production schedules, costs, and plant quality of budded and etiolated plants in a commercial nursery.

Initial comparisons of production schedules shows that etiolation may be as fast or faster at producing the same sized plant as budding (Table 3).

Table 3. Comparing production schedules for field budding and greenhouse etiolation

Time of year	Budding	Field etiolation	Greenhouse etiolation
1987			
January			bring in dormant stockplants
February			etiolate stockplants
March			
April	plant out seedling understock	etiolate stockplants	take cuttings
May			cuttings rooted
June		take cuttings	↙ ↘
July	bud understock	cuttings rooted	grow on / plant out
August		↙ ↘	in
September		grow on in greenhouse / plant out	greenhouse
November			finished plant
1988			
Spring	cut back understock	grow on for another season	
Fall	finished plant	finished plant	

Budded plants are produced by planting out the understock in the spring, budding in mid to late summer, cutting back the understock the next spring, and then growing on the new scion bud for one growing season before sale.

Field etiolated plants can be produced by etiolating stockplants right before bud burst in spring, uncovering and banding the new shoots a few weeks later, leaving the bands on for 4 weeks, taking cuttings by late June or July, and then rooting them in a mist bench for another month. After another season's growth they should be comparable to budded plants in size and quality. Greenhouse etiolation considerably lessens the time it takes to produce a plant of comparable size. Dormant stockplants can be potted up and forced in the greenhouse during January and February thereby producing rooted cuttings by May or June of that same year. The rooted cuttings can then be grown on in the same growing season to produce a finished plant by the end of that year. The cost of producing plants by these three methods is summarized in Table 4.