Winter Propagation of Conifer Cuttings for Multiple Genera©

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INTRODUCTION

Winter propagation of conifer cuttings at Stanley & Sons Nursery must take into consideration many different variables. At the nursery we grow over 2500 taxa of conifers that cover 53 genera.

To make such diversity of product a practical proposition, measures had to be taken to simplify the propagation process. In the 26 years of Stanley & Son Nursery, we have used only three rooting media, two rooting hormones, and one greenhouse. The fewer the variables in the process, the fewer questions that may arise about each variety. We believe consistent and simple processes to be the most defining thing we do as a nursery.

The focus of our production is to gain the highest possible percentages on our most popular varieties, while achieving sometimes lesser, but still acceptable results with the other varieties. Plant material needed for production that does not fit our propagation program, due to timing or temperature, is purchased from contract growers.

GREENHOUSE SYSTEM

In a metal frame greenhouse 30 ft × 75 ft, with double 6-mil clear plastic, we grow 300,000 cuttings per year. The greenhouse ends face North and South with large fir trees on the south side.

These fir trees block the low elliptical orbit the sun makes in winter. The source for heated air and water is natural gas. The air temperature is kept above 40 ºF and below 60 ºF, during October through February, by an overhead fan and heater rated at 225,000 BTU. Hot air is released through two exhaust louvers on the south end and is replaced with one large intake fan on the north.

The heated water needed for our cutting beds are provided by a 50-gal water heater. The cutting beds are a closed system unit with water being circulated through the pipes at about 4 MPH. The beds were constructed in ground. Each bed has a 2 inch-thick piece of Styrofoam, R11 rated barrier, to insulate from ground temperatures. One inch of 1/4-minus asphalt gravel was put above the insulation, then the 1-inch PVC pipes were put every 6 inches on center the length of the beds with a common manifold at each end. Each of the two beds that share the water heater have a drain as well as a release nozzle. One more inch of 1/4-minus gravel was leveled on top of the pipes. This type of gravel compacts very tight, when covered with weed mat, the result is like a concrete surface. Flats are filled at work benches and then placed on the weed mat.

A temperature between 65 and 72 ºF is maintained. This temperature is recorded by thermometers placed in the flats in the beds at random sites. An electronic control unit releases new amounts of hot water for circulation by a sensor. The sensor is at one end of one bed, hence the need for the other heat readings to adjust the electronic control. It is necessary to make watering the responsibility of one individual to avoid duplication.

Hand watering is also necessary to accommodate the moisture requirements of each media.

MEDIA

The media is directly put into the trays (Anderson) then taken to tables for filling with cuttings. When not full of cuttings, we still water the tray and have it on the heat beds. The three media we use are:

- Sand — This is river sand from the Columbia River.
- Sand and peat — A 4 river sand and 1 Canadian peat (v/v).
- Pumice and peat — A mix of 4 Canadian peat and 1 small 1/8-crush pumice from Eastern Oregon (v/v).

Each medium is watered by hand and is treated differently. The person watering determines moisture by feel, not by a visual surface survey.

TIMING

Cutting production is done in the months of October through February. For a complete list of each genus and when they are propagated look at Table 1. The start of propagation is usually after a few days of temperatures below 32 °F. This is to make sure the wood has been hardened-off sufficiently as not to have weak and soft wood that desiccates.

Material that needs to be taken before or after these months are being stuck for us by hired propagators. Examples of this kind of material would be adult foliage *Chamaecyparis*, which need to be done at a later time, hemlocks, which need a lower bottom temperature than our beds provide, and *Cupressus* which need a more complex set of hormones.

Our window for taking cuttings is not entirely determined by the plants. While every effort is taken to ensure wood is collected at its optimum, factors such as a limited work force, shipping, grafting, and “acts of God” do impact or timing.

CUTTING PREPARATION

Most material is taken fresh and stuck every day, with some material having 1 week, at best, in refrigeration. All cuttings are washed and treated with a fungicide (Captan). Lower leaves are stripped by hand on most cultivars, while others have special wounding characteristics. Plants are stuck either 126 or 252 per flat depending on the size of cuttings.

Rooting hormones are mixed new every day and plants are dipped and directly stuck into flats. Some are double-dipped while others are soaked. Our procedure and use of rooting hormone by genus is shown in Table 1.

The aftercare of all beds when filled with cuttings consist of a routine spraying of Zerotol® and half-strength mixture of organic fertilizer (Metanaturals with micronutrients and humic acid). Flats are also regularly cleaned of dead or diseased wood, weeded as time permits, and treated with a pesticide and fungicide as needed.

We have recently implemented a study to evaluate the use of beneficial bacteria and fungus in our propagation media. Some flats are being inoculated with mycorrhiza, others with *Bacillis subtilis*, and still others with both. The study is in its preliminary stages and it is still too early to determine what effect if any these substances will produce.

Table 1. Winter cuttings procedure and results by genus.

Genus	Month propagated	Media	Hormone	Ratio	Additional treatment	Rooting (%)
Abies	Dec.-Jan.	sand/peat	Woods	1:10	-------	45
Acmopyle	Nov.-Dec.	pumice/sand	Woods	1:10	-------	22
Agathis	Nov.-Dec.	pumice/sand	Woods	1:10	-------	6
Amentotaxus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	60
Araucaria	Nov.-Dec.	pumice/sand	Woods	1:5	soak	22
Athrotaxis	Nov.-Dec.	pumice/sand	Woods	1:10	-------	16
Austrocedrus	Nov.-Dec.	pumice/sand	Woods	1:5	2nd year wood	12
Austrotaxus	Oct.-Nov.	pumice/sand	Woods	1:10	------	22
Callitris	Nov.-Dec.	sand	Woods	1:5	-------	2
Calocedrus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	51
Cedrus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	37
Cephalotaxus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	77
Chamaecyparis	Nov.-Feb.	pumice/sand	Woods	1:5,1:10,1:20	-------	73
Cryptomeria	Nov.-Dec.	pumice/sand	Woods	1:10	------	65
Cunninghamia	Nov.-Dec.	pumice/sand	Woods	1:5,1:10	soak	78
Cupressus	Dec.-Jan.	pumice/sand	Woods	1:10	2nd year wood Double dip	34
Dacrycarpus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	40
Dacrydium	Nov.-Dec.	pumice/sand	Woods	1:10	-------	88
Diselma	Nov.-Dec.	pumice/sand	Woods	1:10	-------	80
Ephedra	Nov.-Dec.	pumice/sand	Woods	1:10	-------	15
Fitzroya	Nov.-Dec.	pumice/sand	Woods	1:10	-------	82
Fokienia	Nov.-Dec.	pumice/sand	Woods	1:10	-------	58
Glyptostrobus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	44
Halocarpus	Oct.-Nov.	pumice/sand	Woods	1:10	-------	58
Juniperus	Dec.-Jan.	pumice/sand	Woods	1:5,1:10	------- Hormex 3	81

Keteleeria	Oct.-Nov.	pumice	Woods	1:10	-------	37
Lagarostrobos	Nov.-Dec.	pumice/sand	Woods	1:10	-------	22
Lepidothamnus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	37
Libocedrus	Jan.-Feb.	pumice/sand	Woods	1:10	-------	56
Metasequoia	Jan.-Feb.	pumice/sand	Woods	1:5	-------	4
Microbiota	Dec.-Jan.	pumice/sand	Woods	1:10	-------	76
Microcachrys	Nov.-Dec.	pumice/sand	Woods	1:10	-------	44
Microstrobos	Oct.-Nov.	pumice/sand	Woods	1:10	-------	85
Nageia	Nov.-Dec.	pumice/sand	Woods	1:5	-------	93
Papuacedrus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	33
Phyllocladus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	14
Picea	Dec.-Jan.	sand	Woods	1:10	-------	28
Pilgerodendron	Oct.-Nov.	pumice/sand	Woods	1:10	-------	25
Podocarpus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	80
Prumnopitys	Oct.-Nov.	pumice/sand	Woods	1:5	-------	22
Pseudotaxus	Oct.-Nov.	pumice/sand	Woods	1:5	-------	72
Saxegothaea	Dec.-Jan.	pumice/sand	Woods	1:10	-------	86
Sciadopitys	Nov.-Dec.	pumice/sand	Woods	1:5	soak	0
Sequoia	Nov.-Dec.	pumice/sand	Woods	1:5	5 min soak Shade	44
Sequoiadendron	Nov.-Dec.	pumice/sand	Woods	1:5	5 min soak Shade	85
Taiwania	Nov.-Dec.	pumice/sand	Woods	1:10	-------	28
Taxodium	Dec.-Jan.	pumice/sand	Woods	1:5	double dip Hormex 3	0
Taxus	Nov.-Dec.	pumice/sand	Woods	1:10	-------	85
Thuja	Dec.-Jan.	pumice/sand	Woods	1:10	2nd year wood	83
Thujopsis	Dec.-Jan.	pumice/sand	Woods	1:10	-------	47
Torreya	Nov.-Dec.	pumice/sand	Woods	1:10	-------	38
Tsuga	Dec.-Jan.	pumice/sand	Woods	1:10	shade	33
Widdringtonia	Oct.-Nov.	sand	Woods	1:20	-------	44

RESULTS

The 53 genera propagated at Stanley & Sons Nursery are shown in Table 1. Each genus has the month propagated, medium and hormone used, ratio of hormone, additional treatment, and percentage of rooted plants. In review, remember that some genera have multiple species. Each percentage is an extrapolation of all the species in that one genus. For example *Chamaecyparis* has five different species (*lawsoniana, obtusa, formosensis, pisiferia,* and *thyoides*).

To restate, the focus of our production is to gain the highest possible percentages on our most popular taxa, while achieving sometimes lesser, but still acceptable results with the other varieties. The inventory need for some of these lesser taxa and rare genera is a part of our business that is not huge, but considered by us as our contribution to horticulture in preserving rare and unusual species.

TC or not TC©

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For those of you who are not familiar with our operation, we utilize programs of field budding, grafting, hardwood cuttings, tissue culture, and softwood cuttings for reproducing the various taxa of ornamental trees featured in our bare-root lineup. My focus is the greenhouse liner production, which supplies each of the satellite farms with various selections of trees like cherry, birch, elm, red maple, willow, and a handful of other types.

"TC" is a real head-turning acronym. TC is commonly associated with tissue culture, or the in vitro propagation of micro-cuttings. However, I also use TC to stand for tip cuttings or the style of cutting I prefer for the summer softwood program.

As most know, many taxa of the most commonly grown ornamentals are easily rooted from cuttings. Budding onto a vigorous root system is a reasonable way to reproduce selections of ash and honeylocust, but graft incompatibility issues influence the reproduction solely by cuttings for a species like red maple. When I started working at Holmlund's Nursery, there was already a program in place for raising the liner material in the greenhouse from cuttings and tissue culture plantlets. It was explained to me that the liners that are to be field-planted needed a well-developed root system and a stem hardy enough to overwinter outside. That meant that during the growing season the tops or tips of the plants were chopped off to help stimulate root development and reduce irrigation frequency. At the same time as the greenhouse foraging, the trees in field production were also having suckers cut away and branches trimmed up to facilitate a trained whip. Now, my wife will gladly vouch for me being a pack rat, but I've always seen myself as more of an opportunist. I just hang on to things until the opportunity arises. I see the opportunity at Holmlund's Nursery for us to make something from what is commonly discarded as field waste. Especially on the own-root crops and the new cultivars that our stock plant numbers are low on, a zero-waste cuttings program just makes sense. Now I need to be clear that our cuttings program is based on augmenting or complementing the quantity of plants grown from tissue culture, with the primary goal in mind of planting all container-grown plant material in the fall.