# GROWING DECIDUOUS AND OTHER PLANT MATERIAL IN SMALL CONTAINERS

Growing plant material in containers resulted in a uniform product in less time.

**G. Grainger,** Superintendent
Provincial Tree Nursery
Edmonton, Alberta Canada

For several years the Provincial Tree Nursery has been involved in the development of production techniques for conifer seedlings for reforestation purposes. Coincidental with the development of containerized conifer production, we have worked on problems involved with the growing of deciduous material in the same type of container. The need to grow deciduous container stock is to lessen the time period from seedling to acceptable height and weight standards in this cold northerly climate. The concept is to achieve the necessary height and weight standards and to determine the shortest possible time with the least cost possible, to be competitive with imported transplanting stock.

The plant material worked with in the various containers was Dogwood (*Cornus stononifera),* American Elm *(Ulmus americana),* Manchurian Elm *(Ulmus siberica),* Birch *(Betula papyrifera),* Common Lilac *(Syringa vulgaris),* Silver Buffaloberry *(Shepherdia argentea),* Russian Olive *(Elaeagnus angustifolia),* Villosa Lilac *(Syringa villosa),* Mayday *(Prunus padus commutata),* Chokecherry *(Prunus virginiana)* and Hawthorn *(Crataegus cerronis).*

**Development**

Length of time in the greenhouse varies from 11 weeks for the summer crop, 15 weeks for the spring crop, and 20 weeks for the fall/winter crop.

Temperature variations are as follows:

a. germination 18°C.
b. active growth 18°C, 23°C day, with a gradual reduction to ambient with a bud set period in the greenhouse for the fall and winter crops (5 to 6 weeks at 7°C to 16°C).

Lighting regime consists of both fluorescent and incandescent light which gives approximately 350 f.c. at bench height (bench to light 4 feet maximum). The variation is as follows:

a. germination—natural day length
b. weeks 1 to 3—22 hours
c. week 4—20 hours
d. weeks 5 to 10—18 hours
e. week 11—16 hours with a gradual reduction to natural day length

Our crop schedule used to date:

Crop 1: February 15 to May 15
Crop 2: June 1 to Septem ber 1
Crop 3: September 15 to January 31

Humidity is controlled to provide greater than 80 percent for the first 5 weeks; 60 percent for weeks 6 to 10; and a gradual exposure to outside conditions after week 10.

Fertilizing has evolved into a simplified program after many and varied applications were tried. Many application programs were found to be too inefficient, costly, and ineffective. We now begin fertilizing 2 weeks after germination with a high phosphate, switching to high nitrogen for active growth (200 parts per million, nitrogen), then back to high phosphate for bud set and hardening off (80 parts per million, nitrogen). Fertilizing is done on a Monday, Wednesday, and Friday rotation with variations applied depending on season. The seedlings are watered 10 minutes before fertilizing is done. This is to lessen the level of accumulated salts.

The medium used is peat and vermiculite mix (2:1 ratio), treated to raise the pH to a minimum of 6.5. Calcium carbonate is added at various rates depending upon the pH of the peat at the time of mixing. The medium is mixed with water to 85 percent capacity and maintained at that through germination or until watering is commenced. The media is as sterile as can be achieved without breaking the moss structure down to very small "fines."

**Data and Results**

Table 1 indicates the various heights, shoot:root ratios, age, and container sizes of sample stock. Results of our work indicate that certain deciduous species are well adapted to container growing. Among those are white birch, dogwood, mayday, chokecherry, both elms, alders and roses. The cherries and hawthorn take longer to reach the 46 cm height limit set once the stock is moved outside. This could be overcome by increasing the greenhouse time for these two species. Those not suited to these containers are the lilacs; however, work continues to overcome growth problems.

We have found the optimum container for growing these species to be the 131 or 150 $cm^3$ size. With the larger size stock requirement and larger container, the production costs are slightly in excess of $85.00 per thousand live seedlings of shippable size.

Table 2 indicates survival percentage of stock shipped for windbreaks throughout Alberta. Twenty-five of each species were transplanted on the nursery under conditions similar to field transplanting; i.e., watered only on plantings, weed control minimal, and no fertilizer applied. The transplant area was infested with grasses and perennial weeds.

**Table 1. –** *Sample stock data of container-grown species at the Provincial Tree Nursery*

| Species | Crop | G H. Weeks | Total weight (grams) | Shoot: root ratio | Height (cm) | Container size (cc) | Age at sample date (weeks) |
|---|---|---|---|---|---|---|---|
| Hawthorn | 73 | 12 | 0.9250 | 0.5900 | 13.44 | 37 | 54 |
| Chokecherry | 3-74 | 10 | 3.2000 | 0.4200 | 19.61 | 500 | 52 |
| Russian olive | 4-74 | 12 | 1.8100 | 1.1700 | 25.10 | 500 | 52 |
| Mayday | 1-75 | 15 | 1.1780 | 0.7000 | 15.60 | 150 | 50 |
| Dogwood | 2-75 | 11 | 2.5400 | 0.7400 | 32.90 | 150 | 32 |
| Villosa lilac | 3-75 | 20 | 0.1800 | 0.3800 | 3.04 | 37 | 32 |
| Common lilac | 3-75 | 20 | 0.1900 | 0.3980 | 4.40 | 37 | 32 |
| Siberian larch | 1-76 | 15 | 0.2170 | 0.7380 | 7.50 | 37 | 32 |
| Silver buffaloberry | 1-76 | 15 | 0.0530 | 0.8250 | 6.75 | 37 | 32 |
| Manchurian elm | 1-76 | 15 | 1.2675 | 0.5475 | 23.80 | 37 | 32 |
| American elm | 1-76 | 15 | 1.2695 | 0.4030 | 15.40 | 150 | 32 |
| White birch | 2-75 | 11 | 0.2300 | 2.8080 | 19.40 | 37 | 32 |
| Dogwood | 6-76 | 0 outside crop | 0.9175 | 0.4800 | 17.75 | 150 | 17 |
| Trembling aspen | 2-76 | 11 | 1.0360 | 0.8090 | 25.40 | 150 | 17 |
| Dogwood | 2-76 | 11 | 0.5510 | 0.7106 | 18.90 | 150 | 17 |
| Alder | 2-76 | 11 | 0.1650 | 0.6290 | 3.45 | 150 | 17 |

**Table 2. –** *Container stock survivals of deciduous plantings at Provincial Tree Nursery*

| Species | Crop | Survival (percent) | Age of planting |
|---|---|---|---|
| American elm | 2-75 | 88 | 2-0 |
| Dogwood | 2-75 | 68 | 2-0 |
| Mayday | 1-75 | 96 | 2-0 |
| Manchurian elm | 1-76 | 64 | 1-0 |
| White birch | 1-75 | 40 | 2-0 |

Field survival of those transplanted at the nursery was good—up to 96 percent. The stock being transplanted in mid July—white birch and American and Manchurian elm—showed very little set back because there was little or no root disturbance. The birch suffered most from dry soil conditions and drying winds.

One major advantage to using this container method is the capability of lengthening the field transplanting season. It has been shown that the stock can be raised to the required height in a short period of time in limited space (36 plants per square foot when using 150 $cm^3$ container). We use this method to start stock and then later transplant into larger pots and baskets for specific uses. The loss has been very minimal to this date. (We have overwintered most of the stock for only one winter.) When the stock has had 2 overwinterings, loss averages 5 percent.

The small (37 $cm^3$) container is used to grow conifer seedlings for transplanting on the nursery instead of using seedbeds. Again the practical reasoning is to shorten the time period. Instead of using a 3-0 seedling, we are now transplanting $1_c$ and $2_c - 0$ stock. We can now grow a 40 to 60 cm shippable seedling in 3 to 4 years rather than in 5 or 6 years.

**Table 3. –** *Container stock survivals of transplants at Provincial Tree Nursery*

| Species Crop | Survival (percent) | Age of planting |
|---|---|---|
| Colorado spruce 6-73 | 72 | $1_c$-0 |
| Lodgepole pine 3-7b | 72 | $2_c$-0 |
| White spruce 3-74 | 66 | $2_c$-0 |

Table 3 indicates survival percentages of stock transplanted into nursery transplant beds. The Colorado spruce was the first major container crop transplanted on the nursery and will be shipped in the spring of 1978 as 46 cm seedlings. In 1977 the nursery transplanted over 700,000 spruce seedlings; the majority (nearly 600,000) were container grown. The stock at transplanting must be 10 cm minimum but no larger than 23 cm. Most of our transplanting is begun in mid August.

We use a modified mechanical transplanter with rubber cups. The seedlings are spaced approximately 10 cm apart.

This container program has added speed to and a more uniform product for our program needs.