6. Goodman, M. A and D. P. Stimert. 1987 Factors regulating overwinter survival of newly-propagated stem tip cuttings of *Acer palmatum* Thunb. 'Bloodgood' and *Cornus florida* L. var. rubra. *HortScience 22:1296–1298.*

7. Gouin, F. R. 1974. Osmocote in the propagation house. *Proc Inter Plant Prop Soc* 24:337–341.

8. Hambrick, C. E. III. 1985 The correlation of carbohydrate/nitrogen ratios and rooting ability of *Rosa multiflora* stem cuttings. M S. Thesis, Texas A&M University, College Station.

9 Johnson, C R. and D F. Hamilton. 1977 *Jour. Amer Soc Hort Sci* 102:320–322.

10 Johnson, C. R. and A. N. Roberts. 1968. The influence of terminal bud removal at successive stages of shoot development on rooting of *Rhododendron* leaves. *Proc Amer Soc Hort Sci* 93:673–678

11. Maynard, B. K and N L Bassuk 1987. Stock plant etiolation and blanching of woody plants prior to cutting propagation. *Jour Amer Soc Hort Sci* 112:273–276.

12. Reuveni, O. and M. Raviv. 1981 Importance of leaf retention to rooting avocado cuttings. *Jour Amer Soc Hort Sci* 106:127–130.

13. Smally, T. J. and M. A. Dirr. 1988. Effect of night interruption photoperiod *treatment on subsequent growth of Acer rubrum cuttings. HortScience* 23:172–174.

14. Struve, D K. 1981. The relationship between carbohydrates, nitrogen, and rooting of stem cuttings. *The Plant Propagator* 27(2):6–7.

15. Wright, R D., J. N Booze-Daniels, and R. E. Lyons. 1984 How long should growers wait to fertilize cuttings that have rooted. *Amer. Nurs* (Feb. 15):57–59.

GROUND BEDS VS. CONTAINERS FOR SEEDS AND CUTTINGS

RANDY DAVIS

Greenleaf Nursery Company
Route 1, Box 163
Park Hill, Oklahoma 74464

Greenleaf Nursery, located in Park Hill, Oklahoma, is a wholesale nursery specializing in production of "Predictable Quality" container-grown ornamentals. Besides ornamental shrubs and trees we also grow annual and perennial color crops for fall and spring.

At Greenleaf we produce about 10 million liners annually. Most are propagated by cuttings, but we also propagate by seeds, grafting, budding and division. Our liners are grown either in ground beds or in containers, depending on the type program we have for production of that crop.

In our production the most economical method of liner production is through the utilization of raised ground beds rather than containers. Cuttings are rooted in ground beds, grown in this method

and planted bareroot into 1- and 2-gal. containers. Using ground beds and planting bareroot we can reduce the cost of our liners, compared to propagating in containers, by about 8 to 10 cents per plant. The following are some methods that we use to propagate and grow our liners.

JUNIPER PRODUCTION

Our juniper production is in raised ground beds with a medium of ½ pine bark and ½ sand. The cuttings are taken from November through March using dormant hardwood cuttings. They are then placed in quonset-type houses that are covered with one layer of plastic and heated to 32°F. The cuttings callus during the winter months. Rooting occurs as spring temperatures rise. They are bed-grown one growing season and are planted about February 15th. By planting in early spring while it is cool we can plant bareroot with excellent success. Not only does this method eliminate the cost of plastic trays or pots, it also requires less production space. Less labor is needed in ground-bed production than with container liner production. Ground-bed production is the most economical method to produce our juniper liners.

BROADLEAF AND DECIDUOUS SHRUB PRODUCTION

Most of our broadleaf and deciduous shrub liners are produced in containers. Our severe spring freezes require that we wait until April 15th to plant our liners. Planting bareroot at this time of year with most plants results in poor survivability and slow takeoff after planting. By using containers we get good survival and almost immediate growth after planting.

In the past, cuttings were stuck in ground beds during summer months. The rooted cuttings were dug in the fall and potted into peat pots. They were plunged back into quonsets for winter and planted in spring. This method required considerable labor because we handled the plants so many times. The peat pots caused damage by inhibiting rooting into the surrounding medium in the larger container.

Liners are now grown in plastic cell paks. First the cell paks are filled with medium using a Gleason Model 30 flat filler. The cell paks are then taken to the greenhouse and set in place. The trays are set on a gravel base with a layer of Supac between the tray and gravel. Cuttings are then direct stuck into the individual cells in the trays. As rooting occurs the Supac allows the roots that emerge from the drain holes to penetrate into the gravel. However, the roots are girdled at the area where they pass through the Supac and it is easy to move the trays because the roots break off at the girdled areas. The plastic cell pak holds 24 liners and can be hauled to the field as a unit. This eliminates having to flat individual pots for hauling.

The cell paks cost 27 cents per unit or 1.13 cents per cavity as

compared to peat pots at a cost of 2.3 cents each. The cell pak is a disposable unit. It is used once and discarded. We use 45,000 trays per year so it is very expensive to sterilize and store that number of units each year. Another advantage over peat pots is that the roots are not inhibited and grow into the surrounding medium very quickly.

SEEDLING PRODUCTION

Seedling production is through the use of both ground beds and containers. Ground beds are used for cultivars that can be transplanted bareroot. Cultivars that do not transplant very well are grown in containers on raised wire benches; air pruning is used to get a good fibrous root systems. The use of raised benches and containers is more costly than ground beds, therefore most of our seedling production is in ground beds.

BARE ROOT VS. MILK CARTON SEEDLINGS

CHRIS C. THREADGILL
Sierra Chemical Company
12101 Woodcrest Executive Drive, #190
St. Louis, Missouri 63141

Historically, tree seedlings have been grown in raised ground beds in the field. High production densities and low production costs are associated with these methods of production.

Over several years a new concept in seedling production has emerged that warrants consideration by the nursery industry. In this system tree seedlings are produced in bottomless containers or "milk cartons." I have been asked to present the advantages and disadvantages of both systems. Some of the differences are included below:

BARE ROOT

Advantages: Relatively low initial cost, high production in limited area, light weight (shipping and handling), and ease of planting.

Disadvantages: Harvest season restricted, refrigerated storage required, one crop per season, greater transplant shock, certain species difficult to store, subject to spring frosts, weaker stems due to crowding, and more disease- and insect-prone due to crowding.