Pot in Pot: From Concept to Reality — II

Walter J. Cullen
Midwest Groundcovers, PO Box 748, St. Charles, Illinois 60174 U.S.A.

INTRODUCTION

I'll begin by telling you who we are. Midwest Groundcovers is a Wholesale Container Nursery started in 1969 by Peter and Irma Orum. We are propagators and growers of: groundcovers, perennials, roses, vines, and shrubs, and we service landscapers and garden centers in the Chicago area and Midwestern states.

I think we have all heard some version of the old saying: "The customer is always right." Although we may get a little tense about this sometimes, I think we all agree, we need to listen to what the customer has to say if we are to remain competitive in the marketplace. My presentation explains one way our company has tried to respond to customer demand in the market.

In our industry there is an increasing demand for larger sized landscape plants. We can sell half of our 5-gal deciduous crop in the same season it is produced. Spring is when we make 60% to 70% of our annual sales. This would suggest we are missing out on 30% to 40% of the potential spring sales of this crop. The easy answer is, "Make more!" right? There are two things preventing this: (1) Our current growing facilities are filled; (2) Capital for new production facilities is limited.

The options we considered in responce to this need are: developing land we currently owned or developing leased or rented land. Using our own land sounds good, but finances and timing are limiting. Rented or leased land seems more feasible. We know the costs of building our own production systems, and the costs of our quonset houses and the plastic to cover them. We have heard of something called a pot-in-pot production system. As a matter of fact, a fellow plant propagator, Charlie Parkerson of Lancaster Farms, is using this system. So we took a trip to see Charlie on a fact-finding mission.

Our hosts are gracious and really practice the slogan of I.P.P.S.: "To Seek and to Share". The system as they use it, certainly appears successful! The key points of the system are: Empty containers are "planted" in a field, much like a field production system. Plants potted in containers are nested into these "socket" pots. The pot (root system) in the ground should be less susceptible to the heat of the summer as the sun does not strike it and the surrounding soil cools it. The pot (root system) in the ground is also insulated by the soil from winter cold and rapid temperature fluctuations.

Some considerations we found pertinent to our situation were:

- Container types and sizes;
- Irrigation system, pressure, and filtration;
- Fertilization method;
- Plant spacing;
- Installation methods;
- Problems unique to the system;
- Pests;
- Costs.

Back at home, our challenges are to research costs, determine installation methods, and design trials. For my part, I will concentrate on our trials.

THE POTS

Beginning with the easier decisions, the container size would be 5 gal as this is our product line. The in-ground, or socket pot, was not a difficult match since our pot supplier makes a more sturdy pot which fits this use perfectly. It turned out that our 5-gal containers worked fine in this system. However, larger containers might encourage plants to grow larger, with a better balance of root system to top growth. Looking to the future, in our 2nd year of trials, we will try some 7-gal containers as well.

PLANT SELECTION

As we thought about plant selection, we considered several factors. The installation equipment would impact the spacing between rows in the field, the tendency being toward wider spacing. To be efficient in land use, plants requiring wider spacing should be used. Using a similar argument, plants on tighter spacing fit more plants per square foot. If the price is near the same regardless of spacing, it is more cost efficient to grow tighter spaced plants in existing production areas.

To ensure timely turnover of crops, plants were chosen for their popularity. In the 1st year, 15 taxa were chosen based on space requirement and popularity. These taxa: *Cornus* 'Isanti'; *Cotoneaster acutifolius*; *C. apiculatus*; *Hydrangea arborescens* 'Annabelle'; *Juniperus sargentii*; *J.* ×*pfitzeriana* 'Mint Julep' (syn. *J. chinensis* 'Sea Green'); *J. horizontalis* 'Blue Chip'; *Potentilla fruticosa* 'Jackman's Variety'; *Ribes alpinum* 'Europa'; *Spiraea japonica* 'Little Princess'; *S. nipponica*; *Syringa meyeri* 'Palibin' (syn. *S. palabin*); *Thuja occidentalis* 'Brabant'; *Viburnum dentatum* Autumn Jazz™ arrowwood; *V. lantana* 'Mohican'. Of these, six seemed suited to pot in pot after the first season: *C.* 'Isanti'; *H.* 'Annebelle'; *S. nipponica*; *T. occidentalis* 'Brabant'; *V. dentatum* 'Autumn Jazz', and *V. lantana* 'Mohican'.

The remainder of the taxa were stunted or grew with less vigor than above-ground plants. Of the plants that appeared healthy in pot-in-pot production, most grew larger than the above-ground controls in the normal production system. This season, though we can't explain why, we've found many of the plants that did poorly in last season's trials are performing well this year.

IRRIGATION AND FERTILIZATION

Plans began to get more complicated as we considered irrigation and fertilization. Our friends in Virginia use both liquid and slow-release fertilizers in their program. A slow-release program can be very efficient in fertilizer dispersal and, with proper irrigation practices, runoff can be minimized. Slow-release fertilizers rely on water contact to carry, and in many cases activate the product. Charlie Parkerson of Lancaster Farms uses a spray stake attached to a drip tube. It delivers 7 gal h^{-1} (gph) in a 180° or 360° pattern.

We are a liquid-feed operation. We are not experts in the use of slow-release fertilizers. We use overhead sprinklers on our smaller materials and in-line drip irrigation in our 5-gal growing areas. If future expansion takes the rented/leased farmland route, it would be our desire to minimize run-off. Our drip system would not be effectively used in combination with slow-release fertilizers. Nor would it work well during the harvesting of pot-in-pot crops.

As far as irrigation systems go, we tested three brands of spray stakes of varying throw patterns and delivery rates, as well as our own in-line drip. Spray patterns included 90°, 160°, 180°, and 360°. Delivery rates were 3, 4.2, 5, 6.6, or 7 gph. Spray patterns seem unimportant but placement of the stake was critical to keep the water within the pot. While 3 gph produced good quality plants, the largest plants were produced using delivery rates greater than 3 gph. The highest rates appear to be overkill for this size container, 4 or 5 gph are sufficient for our needs.

Fertilization trials were carried out in two growing areas. Our own liquid feed in one area, and two slow-release fertilizer products in an area in which we had the ability to irrigate with unfertilized water. For reference we included some plants that would not receive liquid feed or slow-release fertilizer. Slow-release products containing high percentages of nitrogen were chosen since our soil mix contains good amounts of phosphorus and potassium. They were products with 5 to 6 months release time and applied in April since we wanted the plants to run out of fertilizer in the fall.

As I mentioned, we are not slow-release experts. The soil of the plants in both slow-release trials showed very high salt levels in July with nitrogen levels 2 to 8 times optimum. By September nitrogen levels had dropped dramatically to ⅓ to ½ optimum. Despite the high salts, the plants we felt benefitted from pot-in-pot culture and put on good growth. *Hydrangea* in particular showed extreme symptoms of nutrient stress. For the 1999 season we delayed the slow-release application to June 1st and tried using 3- to 4-month products. So far the results are more favorable, though less dramatic, with all plants having similar healthy shades of green (Fig. 1).

Figure 1. View over the fertilization trials.

SPACING

The first season we put all plants on 36-inch centers for ease of installation. The first season it appeared that plants we normally space closest performed the most poorly. This season (our second season of trials) many of these "poor performers" are growing considerably better, though the reasons are unclear. We've found that detailed measurements, not visual observations, will be necessary to determine whether more space or a larger pot will improve plant quality.

The second season of trials we have begun looking at spacing slow-growing types closer within rows. The idea being it might be economical to produce smaller types in this manner in the future. This would be an easier adjustment and more likely an option than pushing rows tighter together. We also spaced some taxa wider, and put them in larger pots to see if a plant might grow bigger in this system if allowed more space and rooting area to grow.

ROOT ESCAPE

Due to the small relative size of the plants we grow, we did anticipate little problem with roots escaping the two pots and growing into the surrounding soil. We did, however, develop trials to explore the potential of the problem. A root-control product currently popular in the market is a copper compound painted on the inside of growing containers. The compound inhibits root growth on contact, but loses its inhibiting effect once the plant is removed from the container. Another product involves a cloth with capsules impregnated with herbicide, used to control weeds in landscape beds, etc. A piece of the cloth is placed in the socket pot, the cloth and herbicide get wet, and the herbicide volatilizes. The vapors produced should inhibit root growth in the space between the two containers. Our trials included plants with one or the other product, both products, and neither of these two products.

We learned, from the control portion of the trial, that we must take this factor seriously. Some taxa in which we anticipated root escape, like *C.* 'Isanti', were not a problem. Others, like *T.* 'Brabant', seemed to ignore the control measure.

COVER CROPS

As we thought about harvesting the plants, we considered weather conditions at these times. In the summer there should be no problem, but in the spring there can be extended rainy, wet periods. For this reason we seeded grass between some of the rows to provide a stable surface to walk on throughout the year. This caused an impossible situation to maintain. Beside the problem of trying to cut the grass and not the drip tubes, the grass out-grew the plants. Eventually, we sprayed herbicide on the grass before the plants got too big. This would provide a short-term solution. This season we came upon an unexpected source of hardwood mulch which we spread between the socket pots prior to "planting". This appears to be a strong option if economically feasible.

OVERWINTERING

An important part of the trial was winter hardiness. While the root systems are protected more than sitting outside above ground, would this be enough? What varmints might feast on them? Would the plants be smashed by snow/ice?

We certainly had cold temperatures, near record-breaking at -25°F. Unfortunately for the trial, we also had 24 inches of snow on the ground at that time. In our area, snow cover is very unreliable as a form of winter protection. All plants that were alive in the fall made it through the winter. We will repeat this portion of the trial this coming winter.

PESTS

Surprisingly, rabbits and mice have not been a problem to this point, although deer damage has been evident.

CONCLUSIONS

We certainly have learned a lot throughout the investigation of this production process. We are still scratching our heads about some things. Many taxa show great promise in the system while others do not. Our own method of fertilization appears to work best within our version of pot-in-pot production. Spray stakes are an effective method of irrigation in this system. Each plant type must be tested as to the benefits of: root control measures, spacing, overwintering, and overall success within the system. There are many factors to consider, but we think our work will pay off in the long run.

Acknowledgments. I would like to thank Peter Orum for encouraging and sponsoring me in this presentation, Gary Knosher for allowing me the time to work on the project, Charlie Parkerson and the staff at Lancaster Farms for sharing their knowledge and hospitality, Robert Adolph for installing a "new" system and making it work, Mike Rizzi for your assistance throughout the project, the Midwest Groundcovers staff for your patience and cooperation, and my wife, Denise, for letting me go to Denmark to present this paper.