An introduction to pot-in-pot nursery production©

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INTRODUCTION

The nursery industry is highly dependent on container plant production. Utilizing sustainable inputs and adopting sustainable practices have become a significant trend for horticultural production world-wide. This has led to a significant increase in pot-in-pot nursery production in the USA, especially for large caliper trees traditionally produced as field-produced balled and burlapped crops (McNiel et al., 1996). Pot-in-pot production is a combination of traditional container and field production where the production container is placed within an in-ground socket pot (Figure 1).

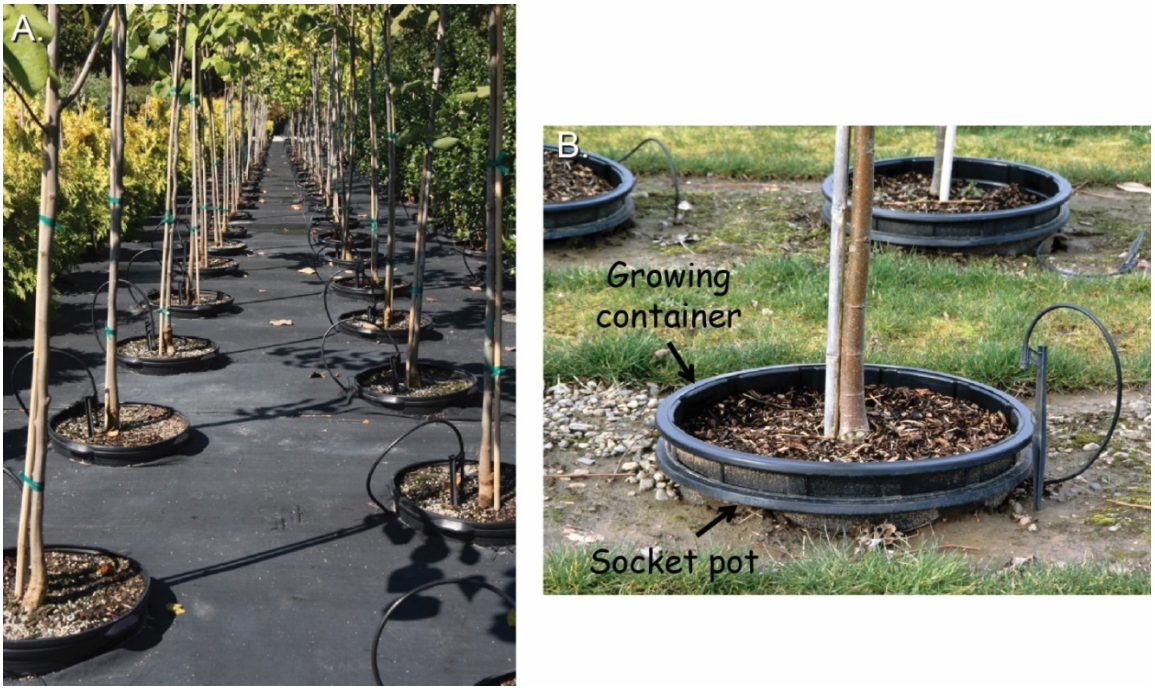

Figure 1. Typical components in a pot-in-pot production system. Left: Containers on a high density planting using an in-row fabric floor management. Each tree is staked and has an irrigation spray stake from main lines covered by the fabric. Right: Floor management with an in-between row grass cover. Side view shows the relationship between the socket pot and the growing container.

Pot-in-pot production was originally developed as the "Minnesota System" in the 1980s as an alternative to field and above-ground container production for tap-rooted shade trees (Pellet et al., 1980; Pellet, 1983). The system proved to be equally useful for general shade and flowering tree production (Parkerson, 1990). The major advantages of pot-in-pot production compared to standard above-ground container production include a reduction in container blow-over tipping, root insulation protection from summer heat and winter cold extremes, and therefore, no need for winter protection. Pot-in-pot also uses water more efficiently because it utilizes microirrigation rather than overhead watering systems (Nambuthiri et al., 2015).

Pot-in-pot is arguably the most sustainable production system for nursery trees.

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Compared to field produced trees, pot-in-pot uses water and fertilizer more efficiently and eliminates “soil mining” because it uses a renewable bark-based growing substrate rather than digging trees from the nursery field. Compared to above-ground container production, pot-in-pot results in a reduced use of plastic where Quonset structures are required for overwintering.

The major disadvantage of a pot-in-pot production system is its high initial installation cost, but these costs can be spread over several years of production. The initial costs can also be off-set by the higher planting density compared to field production (McNiel et al., 1996). Another problem encountered during pot-in-pot production can be roots escaping the growing container making harvest difficult.

Since pot-in-pot is a semi-permanent production system, care needs to be taken during its initial installation. Most sites suitable for pot-in-pot should be relatively level (<3% grade) with easy access to clean water for microirrigation. The most important consideration is soil drainage where the socket pots will be located. Without proper drainage, water will pool in the production holes during periods of sustained rain. For many locations, this requires providing supplemental drainage such as a 4 inch drain tile beneath the planting row of socket pots.

Socket placement and spacing must also be pre-determined. This becomes a fixed spacing of a single size production container for the next five years or more. As with field production, roadways and container spacing must consider access for equipment for spraying, cultivating and harvest as well as anticipated plant size. In general, growers plan for more trees per block for pot-in-pot compared to standard field production. There are several options for digging the socket pot hole involving either trenching, augering or a combination of the two. There is an excellent University of Kentucky on-line video prepared by Dr. Amy Fulcher that describes each type of installation procedure (Fulcher, 2011; http://www.youtube.com/watch?v=wNeBurkznIk). Regardless of the digging method, the socket pot should be placed level with the grade with only the top of the rim above ground.

There are several strategies for nursery floor management around the containers. These include maintaining a bare weed-free area, grass/sod middles between container rows, or a geotextile nursery fabric covering each block. The fabric should be installed after the socket pots are set by fitting the size of the fabric to the tree block and cutting an “X” over each socket pot prior to setting the production container into the in-ground socket pot. There is an initial cost with using the fabric, but it can be easier to maintain during the production cycle and because cultivation equipment will not be required within the block, containers can be staggered between rows leading to more efficient spacing.

Another consideration prior to setting the production container in place is whether a root barrier material will be used to prevent “rooting out”. For several nursery species, rooting out of the production container into the socket pot and surrounding field soil can be a problem. It makes harvest difficult and inefficient. Several chemical deterrents are available to reduce this rooting out problem. One product is a root barrier consisting of a copper-treated fabric that is placed between the production container and socket pot. A second option is using a volatile herbicide impregnated root barrier placed at the bottom of the socket pot. A tight fit between the socket and production container is necessary for optimal control of rooting out.

Water management is most often through a microirrigation system. This is an efficient way to deliver irrigation to each container using a microsprinkler (spray stake or trickle). Like other microirrigation systems, initial water quality, filtering systems, fertigation and water pressure are all considerations that should be addressed prior to planting. It is usually more efficient if plants are grouped by their relative water use requirements. Inspect irrigations lines on a routine basis for leaks or malfunctioning lines to avoid extended periods where containers are not being irrigated. Use of a microirrigation system also allows growers to consider several advanced irrigation practices that can minimize water use and fertilizer run-off and in some cases improve tree growth. These include adopting an on-demand system for scheduling irrigation based on plant water use that could also employ a cyclic irrigation strategy (Geneve, 2014; Nambuthiri et al., 2015).

Another advantage of pot-in-pot production is that harvest is not tied to the traditional digging seasons for field-produced plants. Mid-season harvesting can offer a competitive advantage if a market is available to use these trees. Harvesting involves lifting the production container out of the socket pot. Because of the size and weight of larger caliper trees, mechanical assistance is usually necessary. Both physical and mechanical lifting machinery is available in the trade. These machines basically attach clamps to the growing container rim and use physical leverage or hydraulics to lift the container from the socket pot.

This has been a quick overview of typical pot-in-pot production issues. There are several more in-depth discussions of this system from University Extension publications available on-line. Both the University of Kentucky (Dunwell et al., 2009) and University of Tennessee (Holcomb and Fare, 2009) have excellent publications that are currently available. Each includes an extensive publication lists concerned with the economics and production of pot-in-pot plants.

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