

majority of droplets produced by the nozzle at the stated pressure, is available from the author.

## DISCUSSION

All nozzles except Rainbird Micro-Bird Spinner, Rainbird CPR Series 360°, and Roberts Spot-Spinner produce acceptable particle size and distribution. These nozzles would be appropriate for irrigation only. The Damm Nifty (brown), Eddy Mist, Microjet (white), Naan 7102 Mister, and Solcor 7000C Micro Dan sprayer performed exceptionally well at around 40 psi. The Rainbird Micro-Bird Mister (orange, green) and Roberts Spinner-Sprinkler (No. 2) also gave good results at a higher pressure of 60 psi. All other nozzles would be appropriate for mist propagation with spacing recommended.

## LITERATURE CITED

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## MASS PRODUCTION OF TREES IN GRO-BAGS

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Thorobred Trees produces trees in root-control, field-grow containers on approximately 100 acres in north central Florida. We have been container growers of plants and small trees for 13 years. For the last three years, we have planted approximately 80,000 trees in Gro-bags, 14-, 18-, and 24-inch. We are growing around 35 cultivars of trees for landscape use in the southeastern United States.

Early in 1983 after hearing Dr. Carl Whitcomb present a program on field growing in root-control containers, we decided to try some for ourselves. We planted 1200 trees in 14- and 16-in. Gro-bags. We planted some in our potting soil mix consisting of pine bark, native peat, and coarse sand; some in a blend of potting soil and native sand, and the majority in just native sand. In the first winter the 1983 Christmas freeze devastated about 30% of our container stock, but we had no damage or loss in our bag tree area. The trees planted in native sand grew off much better than the others.

Within 18 months the one-gallon size trees we had planted were reaching heights of between 10 and 16 ft. and calipers up to 3 in. The species we tried were sycamore, Chinese tallow, photinia, red maple, live oak, slash pine, dogwood, magnolia, crape myrtle, East Palatka holly, and laurel oak.

After this initial good experience we started planning our first major crop in August, 1985, and planted over 80,000 trees in the 18 months that followed. After the hard freeze in 1983 and 1985 thousands of acres of citrus production land in north central Florida became available for alternative production use. It is on this former citrus land that we are growing our trees in field-grow containers. The soil in our area is sandy and very well-drained. This type of soil has never been preferred for field growing and ball and burlapping of trees.

Our program on production consists of taking bare-root liners, 1-, 2- and some 3-gal. tree stock, and putting it into 14-, 18- and 24-inch Gro-bags. We planted weeping willow, 'Bradford' and 'Aristocrat' pear, bald cypress, live oak, photinia, green ash, slash and loblolly pine, wax myrtle, crape myrtle, East Palatka holly, Chinese tallow, Shumard oak, Savannah holly, Drake elm, river birch, Chinese pistache, Nellie Stevens holly, magnolia, ligustrum, red maple, redbud, dogwood, sycamore, and podocarpus.

Our soil pH is amended to between 5.5 and 6.5. We set our planting rows as follows: 14-in. bags are six feet apart and six feet on the row in groups of four rows to a section, with a 10-foot road between sections. Our 18-in. bags are set in rows 7 ft. apart with trees spaced 7 ft. down the rows. With 24-in. bags, rows are 7 ft. apart and 8 ft. down the row. We use the "Holofil Planter" to plant our bags in the field.

A four-man crew is used and we have a piecework incentive pay plan for planting. Our four-man crew is paid \$4.00 per hour plus five cents per unit per man for all units over 600 planted in an eight-hour day. This rate will produce a cost of 21 cents per bag planting cost. This does not include putting the trees in the bags.

After bags are in the field, we finish putting in our irrigation lines. Our irrigation systems are Roberts Spitters and micro-jet emitters into black poly tubes which are laid along each row. We apply 3/10 in. of water daily. No overhead irrigation is used in our growing areas.

We apply 350 pounds of nitrogen per acre per year with six applications of 16-4-8 beginning in March through October. Our herbicide program consists of Surflan applied every 10 weeks for preemergence and Round-Up and paraquat for postemergence treatment. We spray pesticides on an as-needed basis only.

Harvesting presents interesting opportunities as no specialized equipment for Gro-bags has been developed at this time. We hand dig as well as use a Bobcat with a forklift to harvest. Upon



harvesting we immediately put all trees into a holding area for a designated period of time to acclimate them for shipping and installation in a landscape site. On some trees we remove the bag and containerize into larger rigid containers.

This is a walk through our production. There are, of course, advantages and disadvantages to using Gro-bags. Producing trees in Gro-bags has afforded growers in central Florida the opportunity to grow in the field in our sandy soil conditions. The Gro-bag does an excellent job of root pruning. This is the first advantage. Trees in Gro-bags have massive fibrous root system. Approximately 80% of the root system is contained in the Gro-bag. The Gro-bag has panels that allow small roots to pass through but restricts the root at the point it leaves the bag. The massive network of feeding roots accelerates the growth of the tree.

The second advantage comes from the increased caliper development and head growth that results from a Gro-bag tree's massive feeder-root system. The third advantage is the compact size of the rootball in relation to the tree size, which makes transporting and transplanting much easier. The fourth and most dramatic advantage is the ability of the Gro-bag tree to establish itself immediately in the landscape setting. When the bag is removed, the stored energy in the restricted root zone promotes new root growth at once. This new growth comes from the many roots that have been root pruned by the Gro-bag. The tree establishes much quicker and there is no need to do major pruning at the new site. Finally, the ability to grow, move, and establish the Gro-bag tree gives the producer in central Florida a higher-quality product to market.

The disadvantages of using Gro-bags include a larger upfront cost in planting as opposed to regular field growing. Also, there is *not any specialized harvesting equipment available at this time*. A third disadvantage comes from the nonrigid makeup of a container. The cosmetic appearance of the bag is less desirable than that of a rigid container.

After looking at all of these advantages and disadvantages, I feel strongly that under our growing conditions the Gro-bag will definitely help us produce high-quality trees at a profit.