CONTAINERIZATION IN THE SOUTHEAST 1/

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Abstract.--Interest in container-grown seedlings continue to grow in the Southeast as research and pilot tests provide further information. For the immediate future, container-grown seedlings will be used primarily as a supplement to bare-root planting stock for extending the planting season, for difficult to grow species, and for use on adverse or difficult to plant sites.

INTRODUCTION

Interest in containerization of seedlings has steadily increased over the past few years. From several small research studies, production has risen to approximately 1 1/2 million seedlings annually. Some of the reasons for the interest in using containerized seedlings in the Southeast are:

--Improving survival and growth of some species such as longleaf pine, black walnut, oak and eucalyptus.

--Extending planting season to allow for better utilization of scarce labor and for planting at the most suitable time for seedling survival, especially on certain adverse sites.

--Shortening time for seedling production, allowing for quick replants of failed plantations or disaster areas such as stands destroyed by wildfire.

--Adjusting nursery production to meet fluctuation of demand for seedlings.

--Need for automating and mechanizing both nursery and field operations to better utilize labor and equipment.

--Easier application of fertilizers and systemics to the seedlings.

--Improving planting techniques (avoiding L and J roots).

1/Paper presented at North American Containerized Forest Tree Seedling Symposium, Denver, Colorado, August 26-29, 1974.

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RESEARCH

The potential for producing container grown seedlings is steadily increasing as more information related to southern species becomes available.

So far, containerized species outplanted in the Southeast include:

Pine	Other Native Hardwoods
Loblolly	Black walnut
Longleaf	Black cherry
Sand	Sweetgum
Shortleaf	Sycamore
Slash	White ash
Virginia	Yellow-poplar
Eastern white	
Oak	**Introduced Hardwoods**
Black	Acacias
Cherrybark	Australian pine
Northern red	Eucalyptus
Scarlet	Mahogany
Shumard	Rosewood
White	Silk oak
	Fir
	Fraser

Probably the earliest large scale testing in the Southeast of the use of containers was by Westvaco in South Carolina and Virginia. They tried a variety of containers, media and nutrients, working mostly with loblolly pine in plastic tubes. In South Carolina survival and growth of the tubed seedlings equaled or surpassed bare root seedlings but the results in Virginia were not as good

LeRoy Jones, using Kraft and polyethylene tubes ,had good early survival of longleaf pine in an early study in south Georgia. After two years survival ranged from 49% to 79%.

In 1969, Region 8 of the National Forest System began pilot studies on the use of tubelings in cooperation with the Southern Station; Harold Derr of the Southern Station headed up that research at the Alexandria Forestry Center in Louisiana. Using 1" x 8" Kraft tubes, 85 acres of longleaf and slash pine were planted under adverse weather and site conditions. While results were not entirely favorable, they were encouraged to make more extensive tests to improve techniques in raising and handling containerized seedlings. Since June of 1971, between 400,000 and 500,000 containerized seedlings were shipped annually to National Forests in eight states from the Stuart Project in Louisiana. During this time a shift was made to the Japanese paper pot and the BR-8 block. Two greenhouses were erected and a mechanized system of filling and seeding the paper pots was developed. Under Jerry Edward's guidance, Region 8 is developing a prototype of a mechanical planter designed for use with containers.

In March of 1971, the container research at the Alexandria Forestry Center was assigned to Dr. James Barnett. Since that time he has carried out research on several species of pine using a number of different rooting media and types of containers.

The North Carolina Forest Service started pilot testing of containerized seedlings in 1972 under the direction of O.C. Goodwin. A small greenhouse was erected and several species of pine and hardwoods, as well as Fraser fir, were grown in Ontario tubes. The tubelings were outplanted during the summer and fall in paired tests with bare-root seedlings. Patterns of survival and growth have emerged and the state has developed experience and techniques on growing and handling containerized seedlings.

For several years the Florida Division of Forestry at their Tropical Forestry Project in south Florida has produced eucalyptus, rosewood silk oak, acacias, mahogany and Australian pine in a variety of containers including plastic pots, milk cartons, speedling trays, a wedge-shaped PVC container and Leach tubes.

Recently, a cooperative research and development program involving Lykes Brothers, the Southeastern Forest Experiment Station, Hudson Pulp and Paper Company and the Florida Division of Forestry has been concentrating on eucalyptus. Research by George Meskimen of the Southeastern Forest Experiment Station on the biological aspects of using containers for eucalyptus continues while the techniques for production are being developed by the state.

Since 1968, the Arkansas Forestry Commission has produced black walnut seedlings in containers on a limited scale for sale to the public. This interest was fostered by dieback of nursery-grown bare-root seedlings. Test plantings in 1968 using Kraft tubes and ice cream cartons provided initial guidance.

The Tennessee Valley Authority, in the interest of producing premium quality hardwoods, is trying several approaches including containers in overcoming the problems related to planting some species of hardwoods. They have also worked with containerized pine on strip mine areas.

At the Southeastern Forest Experiment Station Laboratory located at Athens, Georgia, Donald Marx is working with mycorrhizae. Since most potting medium is sterile, an efficient method of innoculation is needed.

At Oxford, Mississippi, Bernard Dickerson of the Southern Station worked with loblolly pine on erosible soils using the polystyrene bullet. Early survival was good but growth was erratic, apparently due to the variation in root escape from the bullets.

Some of the other companies, institutions and agencies where containerization research and studies are or have been conducted are Stephen F. Austin State University in Texas; Mississippi State University; International Paper Company; Champion International; and Agritec Company.

This information does not cover all of the research and pilot studies underway on containerized seedlings in the southeast but it is representative of the interest that is present.

CURRENT APPLICATION

The 1- 1/2 million container-grown seedlings produced in the Southeast in 1974 are being used in research, pilot studies or small operational plantings.

In the South, the age of seedlings at time of planting varies from 7 to 24 weeks with most being 10 to 12 weeks of age at outplanting. Production facilities range from fully controlled environment including heating, cooling, automatic watering, humidity control and supplemental photoperiods to only partial shade.

Mechanization of the rearing process and use of larger facilities should reduce unit costs. Even with the mechanization of seedling production, the cost of containers, media, nurture and handling for shipping results in a cost per seedling higher than for a 1-0 bare-rooted seedling. To be competitive, savings must occur in the planting process. Some types of containers are cheaper to hand plant with planting rates of two to four times those of bare-rooted stock. With the trend towards using fewer seedlings per acre, the total system of producing and planting container stock may now be economically competitive in some situations to hand planting.

Machine planting rates for containerized seedlings, using standard planting machines, are similar to conventional bare-root stock. A planting machine is needed that will take advantage of the uniform size and shape of a container-grown seedling thereby reducing power, labor requirements and possibly site preparation costs. Hopefully, such a machine will come out of one of the prototypes now under development.

OUTLOOK

Container-grown seedlings currently account for a very small portion of the total seedling production in the Southeast (667 million in 1973). It is evident that there are survival and growth advantages inherent for some species and conditions. This along with the rising demand for seedlings insures continued interest. The increased demand for seedlings is due to the trend of relying on artificial regeneration, intensive culture and shorter rotations, particularly on industrial forests. On the private non-industrial forest lands, the response to financial assistance offered under the Forestry Incentives Program is creating further needs for planting stock. Container-grown seedlings offer the opportunity for assisting in meeting sudden fluctuations in demands with relatively small investments in land and permanent improvements.

The projected production of several facilities now in operation, under construction, or planned for construction during the current year is as follows:

Table 1.--Facilities now in operation or planned for use in 1975 1/

Facility	Primary Species	Type Container	Planned Production (approx.) 1975	Approx. Capacity of Facility
Florida Div. of Forestry	Eucalyptus	plug	400,000	750,000
North Carolina F.S.	Longleaf 2/	plug	500,000	3,500,000
Plant-a-Plug (Crossett, Ark.)	Loblolly pine	plug	560,000	720,000
Georgia-Pacific	Loblolly pine	plug	200,000	400,000
USFS-Region 8				
Stuart (La.)	Loblolly, long-leaf & slash pine	Paper pot	250,000	1,000,000
Osceola, (Fla.)		Paper pot	250,000	750,000
Master Grower (Braselton, Ga.)	On order	Paper pot	3/	10,000,000

1/ This list may be incomplete.
2/ Loblolly pin, white pine, and Fraser fir later.
3/ Currently growing bedding plants (will grow seedlings on order).

In addition to these existing or planned facilities, several companies and state forestry agencies are seriously considering developing the capacity for producing containerized seedlings.

SUMMARY

Containerized seedlings have advantages for the Southeast. These include improving survival and growth of some species, extending the planting season, adjusting planting time to the most suitable time for adverse sites, rapid adjustment of nursery production to meet fluctuations in demand and improving planting practices (avoiding L or J root).

For the near future, the use of containerized seedlings should become a valuable supplement to bare-root seedings. Further refinements can be anticipated on the growth process and the mechanization of the entire system, from growing the seedling to planting operation. In time, containerized seedlings should assume a share of the total seedling production in the Southeast.

The potential for producing container stock is steadily increasing as more information related to southern species is developed and techniques improve.

A bibliography on publications of importance to the Southeast is in progress and will be available on request.

Question: Are container systems adaptable to production of woody ornamentals, fruit trees, or other agricultural crops?

Balmer: Yes. Several years ago when we were looking for containers for forestry purposes, we found that California farmers were using paperpots for vegetables that had been designed for forest tree seedlings. Also, speedling trays, which were designed for vegetables, are used for growing eucalyptus in Florida.