CONTAINER-GROWN SEEDLINGS

W. E. Balmer /1

ABSTRACT

Container-grown seedling production in the Southeast has increased from 1.5 million in 1974 to 2.5 million in 1976 and will probably exceed 5 million in 1977. This is a very small part of the total seedling production in this area. Major interest is in supplementing use of bare root seedlings for improving survival and growth of sane species, extending the planting season, planting difficult sites, research and progeny testing.

This conference is centered around the production of bare root seedlings, so I'll take this opportunity to briefly fill you in on what's happening in the field of container-grown seedlings.

Production

Container-grown seedling production in the Southeast continues to increase slowly but steadily. Last year approximately 2.5 million seedlings were produced in containers here in the Southeast. *As* you know, this is a very small percentage of the total southeastern seedling production.

Nationally, sane 64 million seedlings were grown in containers. The Pacific Northwest continues to be the leader, producing over 50 million seedlings last year. West-wide the total was 58 million. Canadian production in 1973 exceeded 50 million - over 25% of the total Canadian seedling production.

Florida produced nearly 700,000 eucalyptus in 1977 for summer planting, starting them under shade cloth. The Florida Division of Forestry also produces smaller quantities of amenity species in containers.

In those parts of North America where bare-root seedlings require two or more years in the nursery bed, economics play a large part of the interest in developing container systems to produce plantable seedlings in less than a year.

Here in the Southeast the primary interest to date is for improving survival and growth of such species as longleaf, Fraser-fir and eucalyptus. There is some use of container stock, mostly

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[1] Forestation Specialist, USDA-Forest Service, Southeastern Area, State and Private Forestry

loblolly, for extension of the planting season, planting difficult sites such as disturbed surfaces, and planting sites that are inaccessible during the conventional planting season. Other uses include research and progeny testing. Containers offer the opportunity to control the uniformity of rooting volume, media, and nutrients. This even start can eliminate or greatly reduce the number of variables such as spacing and bed density, eveness of fertilizer application, position in the bed, etc., that can arise in stock grown in conventional nurseries. Maintaining integrity of small seed lots is also easier, both at time of sowing and lifting. An idea of the diversity of the kinds of containers available can be gained from a directory of manufacturers and distributors by the ITF (Venator 1975).

<u>Differences Between Bare-Root and Container-grown Stock</u>

The root system of a container-grown tree is essentially intact at time of planting, while a bare-root seedling loses some of its root system during lifting, packing and replanting. The media in the container goes with the plant, providing a microsite for the seedling at the time of planting. This means the plant has a reserve of nutrients and moisture to draw on immediately following planting. The container shapes the root system, while bare-root seedling root system is shaped by cutting, which means the loss of root tips and creates wounds. If the media is sterile and properly handled, soil-borne diseases should be eliminated.

Even though the containerized seedling is usually grown for a much shorter time before field planting, with sane species and conditions, they show survival and growth advantages. North Carolina found growth and survival advantages in container stock (Goodwin, 1976) for longleaf and loblolly. Container stock also provides an opportunity to extend the planting season over the summer months. Additionally, a winter crop of Fraser fir replanted in the spring should produce the equivalent of a 5-year seedling in half the time.

Florida grows eucalyptus for summer planting to take advantage of summer rains and avoid the usual late spring drouth in south Florida. Containerized eucalyptus have a more compact fibrous root system than bare-root seedlings.

<u>Systems</u>

Systems in use here in the South range from simple shade structures to a completely controlled environment. Examples of two different systems are: the completely controlled environment of the North Carolina greenhouse at Clayton and the Florida Division of Forestry shadehouse at the nursery at Chiefland, Florida. The North Carolina greenhouse can handle around 300,000 cells at one time. The exact number will vary with type and size of container. They are producing

Fraser fir, longleaf pine and loblolly pine and plan on at least two crops per year. The environmental controls include temperature, humidity, water, nutrients, supplemental photo periods and CO_2.

The North Carolina Forest Service has developed a greenhouse manual that would be of interest to anyone starting container production (Goodwin, 1975).

The Southeastern Region of the National Forest System has two different types of facilities. One, at Stuart Nursery in Louisiana, has two greenhouses with temperature and water controls. Nutrients, insecticide and fungicides are injected through the watering system. A second facility at Olustee, Florida on the Osceola National Forest is a shade house. Supplemental water, nutrients, and pesticides are provided by an overhead watering system.

There are industrial container greenhouses in Georgia and Arkansas and a commercial greenhouse in Arkansas. Another industrial container operation using a greenhouse is under development in Georgia.

The Commonwealth of Puerto Rico's Division of Forestry has grown the first crop of containerized Honduras pine (pinus caribbea var. Hondurensis) in their new nursery. In shade houses, lack of a dormant season makes containerization a necessity for pine.

Containers

There is a variety of containers in use in the Southeast at this time. Currently, the North Carolina Forest Service uses styroblocks and Spencer-Lemaire Rootrainers and is leaning towards use of the Rootrainers altogether. They hope to be able to use the containers two to three times to help reduce costs.

The Florida Division of Forestry uses Leach tubes for eucalyptus. The "plugs" are removed at time of shipment and should be usable several times.

The Plant-a-Plug commercial nursery in Crossett, Arkansas, uses styroblocks in their greenhouses as does Georgia-Pacific at their Clio greenhouse. Puerto Rico is using styroblocks in their new nursery, while polyethylene plastic bags are still used in their Department of Agriculture nursery. They plan on using each block three or more times.

Region 8 of the National Forest Systems uses Japanese paperpots at their two facilities. These containers are planted with the seedling.

All except Region 8 are using air pruning to prevent root emergence from the bottom of the container. The shape of the paperpot, grooves in the rootrainers and ridges in the Leach tubes and styroblocks prevent root spiraling or wrapping.

A set of probability tables has been developed (Balmer & Space, 1976) to aid the nurseryman in deciding how many seed to use in each cell. A computer program that in addition to predicting seedling distribution in the containers, develops a least cost source for several alternatives if in final preparation. The program also calculates the quantity and cost of seed needed under each situation (Space & Balmer).

Other industrial container facilities in the South are either in operation or under development for research, progeny testing and pilot studies.

Research

Dr. James P. Barnett of the Southern Forest Experiment Station, Alexandria, Louisiana, is continuing his research on several species of pine, using a number of different rooting media and types of containers.

At the Southeastern Forest Experiment Station Laboratory, Athens, Georgia, Dr. Donald M. Marx is stimulating rapid growth of seedlings by inoculating roots with Pisolithus tinctorius. This fungus is particularly well adapted to disturbed sites (Marx and Barnett, 1974). Dr. Marx is conducting a joint study with Jim Barnett at Alexandria on containerized loblolly seedlings. He is also conducting additional studies on containerized seedlings in collaboration with Dr. John L. Ruehle, of the Athens laboratory. They are studying interaction of several variables, fertilizers, different inoculants, several tree species and container types.

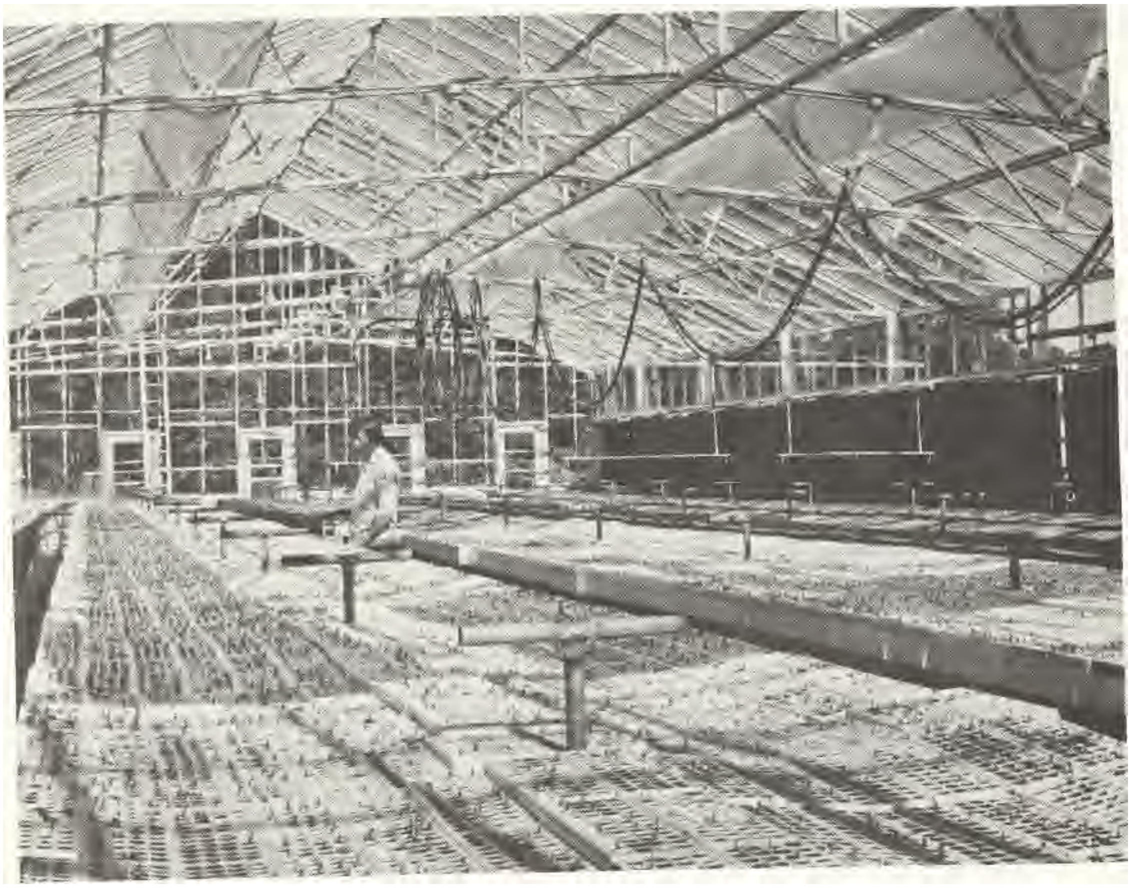
Research on the biological aspects of using containers for eucalyptus continues at the Southeastern Station's Lehigh Acres Laboratory in Florida.

This information does not cover all of the research and pilot studies under way on containerized seedlings in the South, but it is representative of the interest that is present. Much information is being developed on the physiological requirements and behavior of seedlings as a result of these research efforts. These findings could well be as important to the production of bare-rooted seedlings as to containerized plants.

Future

Costs remain higher for the container systems than for 1-0 bare root stock, even with mechanization and automation of the nursery operations. The use of container grown seedlings for special purposes continues to increase. Production in the Southeast should exceed 5 million seedlings in 1977.

Puerto Rico will probably produce an additional 1 to 1 1/2 million pine seedlings in containers. Further refinements can be anticipated on the growth process and the mechanization of the entire system from growing the seedling to planting operation. I believe containerized seedlings, while not supplanting bare-rooted seedlings, will assume a larger share of the total seedling production in the South.



Frazer fir in styrobloeks + "Rootrainers." North Carolina Forest Serviee at Clayton, North Carolina.

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