A SYSTEM FOR PROPAGATION OF SEEDLINGS IN PLASTIC TUBES

ED WOOD

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Until about three years ago, Wood Nursery was primarily involved in growing of ground covers and some larger containerized ornamental plants. We then started working with containerized growing of species for reforestation. After working with their problems for a couple of years, it seemed that those problems were in many cases synonymous with those of ornamental growers. Within the last two years, we have trial-grown many ornamental species from seed hoping to produce not only a better liner for containerized-growing but also liners for field planting. This path automatically led to the production of liners for budding and grafting.

Our seedlings are grown in a high density polyethelyne container, holding 100 tubes. Each tube is approximately six inches long, ¾ inch wide and holds about three cubic inches of germination medium. From past experience, we expect to grow a *minimum of five crops in each container.*

The reasons we settled on such an unconventional size and shape for a container were basically two-fold. First, in our dry planting sites we need a deep root system to reach adequate soil moisture. This same deep root system also helps in container-growing in that we more quickly and evenly fill the container media mass as compared to the normal three-inch liner. The second reason was to prune the tap root as quickly as possible. The tap root of most plants will reach the bottom of the tube by the time the first true leaves are formed. The design of the tube forces the tap root to grow out the bottom of the tube. By growing these plants on screen benches, the tap root automatically dessicates or "air-prunes" itself immediately. This, of course, causes secondary branching. These roots, in turn, are also air pruned. This builds a very compact fibrous root mass rather than a few woody roots. Also, the design of the tube greatly diminishes the coiling effect of the roots observed in normal flat-bottomed containers. Our medium is composed of ground Douglas-Fir barkdust, sand, and peat moss. The Douglas-fir bark is screened through a ¼ inch screen. The peat moss is used for moisture retention and for cation exchange capacity. An 80 cubic foot capacity pre-mix box is used to hold the various components in proper ratio. This can be done while the large concrete mixer is blending the prior mix; it then automatically, by conveyor, refills the mixer.

For filling tubes, we use a conventional Royer Flat Filler. The changes we had to make were relatively simple, one of which was the addition of moving arms while the tubes are being filled to prevent the mix from bridging on top of the containers. Also, in the filling stages, we have added an adjustable pneumatic hammer to insure even compaction of the medium in the tube. Another pneumatic hammer adds a final compaction after the tube has been filled. From this point the tubes are carried on trailers to the greenhouses for seeding.

Seeding is done with a Fricke Vacuum Seeder from Germany. Alteration of the number and spacing of seed delivery tubes on the seeder, as well as a stronger vacuum source had to be made. Although this machine does not perfectly apply the number of desired seed per tube, it is one of the best even bulk applicators we have seen. We achieve the proper number of seed by individual inspection of the tubes. Handling of the tubes is accomplished with a Porta-Veyor system. A one-horsepower unit will carry the tubes at least 150 feet. This is a very easily assembled system of 5 and 10 feet sections and has greatly facilitated the handling of the units in our production line.

The seed is covered after the units are placed on the benches. We use the same mix for covering the seed to avoid an interface problem. This is done by simply dumping quantities of the mix on top of the units and filling the cavities by spreading with a lath.

Watering is done with a moving spray boom. The boom moves at the rate of 8 feet per minute and delivers by dial selector, four different quantities of water. This is accomplished by the use of two water pressure regulators and applied in one or two passes. The first quantity, after seeding, is 1/50 gal. per square foot of area. This permits keeping the seed moist without getting the total mix too wet; 1/25 gal. may be achieved by setting the dial for two passes. After the plants are larger and the water requirements are greater, we can apply 1/5 gal. per square foot with one pass or 2/5 with two passes. The boom is adjustable in height as the seedlings grow. All nozzles are individually adjustable, having on-off valves.

Fertilization and disease control are accomplished by injection through the watering system. Plants are fed every time they are watered. Other controls are as needed.

Most of our seedlings are grown in a series of six greenhouses under one roof. The dimensions of this unit are 250 by 440 feet. In this space, we can seed approximately eleven million tubes. Ventilation is step controlled by a continuous vent on the west side of the building. Air movement is achieved by a bank of exhaust fans on the opposite side of the range. Heat is supplied by two natural gas forced-air heating units per house. These are thermostatically

controlled by the step control unit. We feel this combination of heating and ventilation control gives us a more uniform temperature gradient.

For some plants, we are investigating the use of a larger tube in which the plant is grown for two seasons, using a smaller plug as a transplant. We identify this container as a Dee-Pot. We originally developed this container for use in our Christmas tree growing program. This larger tube is 2½ inches in diameter and 10 inches deep, holding approximately 40 cubic inches of medium.

By using the principles already described, along with the development of properly-sized containers for the many plants that we grow, we hope to offer many advantages to the ornamental grower. Some of these are:

(a) Much cleaner stock with our greenhouse controls as opposed to bed or field growing.

(b) Higher survival rate because of the active fibrous root system.

(c) Using the large plants as transplants for five and 15 gallon cans, allows the grower to sell the normal gallon transplants and take his profit.

(d) Making available understock for bench grafting and budding.

We hope that what we have learned in the reforestation stock may benefit ornamental growing in the above-mentioned and other ways.