GROWING SEEDLINGS IN PALLET-SIZED CONTAINERS--- William A. Sery

ABSTRACT: A palletized planting frame system used since 1970 to produce progeny for rust-resistance screening tests could be adapted to produce seedlings for other purposes. A polystyrene or polyethylene pallet is used as a base; sidewalls are plywood. The system allows use of an artificial soil mix, eliminating the need for fumigation, and makes it easy to move seedlings in and out of inoculation chambers.

INTRODUCTION

Western white pine (Pinus monticola), sugar pine (Pinus lambertiana), and lodgepole pine (Pinus contorta) seedlings are grown in pallet-sized containers for the rust screening program at Dorena Tree Improvement Center. Dorena has been using this size container, which is called a planting frame, since about 1970.

Native soils at Dorena consist of heavy clays, which makes growing trees very difficult and producing uniform seedlings impossible. The palletized planting frame system was devised to provide a good growing medium for conducting progeny tests for screening for resistance to blister rust and western gall rust. Having the planting frames on pallets also facilitates moving the seedlings in and out of the inoculation chamber.

This system, which has worked quite well at Dorena, is being presented with the idea that others may find it of value in specialized situations. Other nurseries that have soil problems may find growing seedlings in planting frames to be superior to growing them in native soil. Proper nutrient levels are easier to maintain in a uniform soil mix, which permits production of superior seedlings.

PLANTING FRAME CONSTRUCTION

The process begins with construction of the planting frames. A 40-inch by 48-inch (102-cm by 122-cm) pallet is used as a base. The pallet needs to be rigid and strong enough to hold a 1,500-pound (682-kg) load. It should also be flexible enough to accept some degree of deformation without breaking. Since pallets at Dorena are recycled every 7 years, they must have sufficient elasticity to return to their original shape after sitting on slightly irregular ground for several years under load. Polystyrene has proven to have all these properties. Some of the better grade polyethylene pallets also meet acceptable standards and are cheaper.

Good-grade polystyrene and polyethylene have been used successfully at Dorena for the past 8 years. Each pallet has 216 3/8-inch (.95-cm) diameter holes, which allows water to drain from the pallet. This is very important, especially for moisture sensitive species like sugar pine.

Of a wide variety of plastic pallets available on the market, only a few are acceptable for planting frames. Many commercial pallets do not have adequate strength and are designed to be disposable for one-way shipments. Some do not have any holes for drainage and others have such large holes that soil mix would fall right through. If pallets are not to be reused, they can be constructed of wood at a cost of about $14.00 per pallet exclusive of labor.

The sidewalls of the planting frames are made of 3/4-inch (1.9-cm) plywood, 1 foot (30.5-cm) high. The plywood is cut to the proper dimension and nailed together. Two bands of 3/4-inch (1.9-cm) wide steel strapping material are wrapped around the outside of the frame and drawn tight to keep the frame from falling apart when it is in use or being transported. The plywood upper frame is then attached to the pallet using 2 by 4's and nails.

About 2 inches (5-cm) of drain rock is placed in the bottom of the frames. This provides drainage and also acts as a barrier between artificial soil media in the frames and the native soil beneath the frames.

SOIL MEDIA

The frames are placed in position and filled with artificial soil media. Dorena is currently using a commercially-prepared mixture of 50 percent peat moss and 50 percent vermiculite with added nutrients. This mix comes in 4 cubic feet (.11m3) bags which are light and easy to handle. Each frame holds 14 cubic feet (.40m3) of mix or approximately 3 1/2 bags.

Dorena used 50-50 peat-sand mix for several years that was mixed in a concrete truck. The peat vermiculite produces superior seedling growth over peat-sand with greater uniformity. Peat-sand was cheaper to buy, but the overall cost was greater because of material handling costs. The need for

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fumigation was eliminated with the new mix so all the labor involved in setting up a fumigation tent was eliminated. Elimination of fumigation also allows for sowing the seed about a month earlier, thus avoiding many fungi problems in the nursery. Peat-vermiculite mix is also considerably lighter than peat-sand mix which means lighter loads for forklifts and trailers.

USE AND PROBLEMS

Western white pine, sugar pine and lodgepole pine are sown in the frames in March. The familial origin of each row of seedlings is identified on the side of the box. Seedlings are sown at Dorena to screen for white pine blister rust and western gall rust. At the end of the second year, the frames are moved into an inoculation chamber where they are inoculated with the rust fungus. They are then placed back in their original positions where rust development is monitored for another 5 years. This means that seedlings are grown in the planting frames for a total of 7 years.

Rodent damage has been a problem. Field mice and gray diggers are the major culprits, but an occasional crow attack has been experienced. Frame tops, which consist of another frame covered with hardware cloth, are placed over the planting frames to provide a physical barrier. An active baiting program is conducted to reduce rodent populations.

Irrigation is accomplished by a shrub head system that projects a fine mist over the frames. Shrub heads are arranged in a head-to-head configuration, which provides even coverage. Solenoid valves are connected to an electronic control device that can be programmed to turn each station on and off at the desired time. Each station can be programmed to come on for a few seconds at a time to provide cooling without significantly increasing the moisture content of the soil. Moisture levels are monitored using gypsum blocks and visual observation.

Fertilizer is injected into the irrigation system in liquid form. Peters fertilizer is used on 1year-old seedlings because of its demonstrated success at standard container nurseries. Other brands may work as well. An 8-8-8 fertilizer is commercially prepared for use on the older seedlings. Trace elements are also added through the irrigation system. Routine soil sampling is performed, and some samples are also sent off for foliar analysis.

The purpose of growing seedlings in this manner at Dorena is to progeny test phenotypically selected trees for resistance to rust. This system is not used to produce seedlings for reforestation, although it could be adapted to do so. Costs of doing this would be high, but it may be cheaper than building up poor-quality native soils.