

Container Handling and Storage in Eastern Canada

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Abstract: Sowing, culturing, and overwintering methods of the 3 largest forest nurseries in Atlantic Canada are discussed. Methods vary from a smaller, hands-on approach to the highly mechanized operations of a private industrial nursery.

Keywords: container seedlings, frost protection, cold protection

Introduction

In order to compare and contrast nursery practices, a few little known facts about Canada, and eastern Canada specifically, should precede a discussion of nurseries in Atlantic Canada. Throughout Canada, approximately 75% of the population lives within 100 mi (160 km) of the US border; approximately 80% of the population lives in large cities.

Nova Scotia and New Brunswick nurseries will be the main topics of this discussion. Nova Scotia and New Brunswick are located east of northern Maine; Nova Scotia is the small piece of land sitting out in the Atlantic Ocean. Nova Scotia is approximately 21,500 mi² (55,700 km²) in size, or half the size of Florida. The province has 4,800 mi (7,725 km) of coastline and supports a population of less than 1 million. The capital of the province is Halifax, with a population of approximately 350,000. Nova Scotia is also the home of the famous sailing vessel, the Bluenose.

Nova Scotia Nursery Operations

In 2002, 23 million trees were planted throughout the province. Approximately 50% of the seedlings were grown in Jiffy pellets, comprised of gauze mesh and peat substrate (Figure 1). The remaining 50% were grown in Multipot hard wall containers (Figure 2).

All seeds sown for Nova Scotia Department of Natural Resources (DNR) originate from seed orchards. DNR also sells improved seeds to private nurseries; the goal is deployment of these seeds as quickly as possible. DNR seed orchards consist predominantly of *Picea mariana* (black spruce), *P. rubens* (red spruce), *P. glauca* (white spruce), *P. abies* (Norway spruce), *Pinus strobus* (eastern white pine), and *Abies balsamea* (balsam fir) for Christmas tree production.

Strathlorne Forest Nursery

Strathlorne Forest Nursery is operated by Nova Scotia DNR, and is located on Cape Breton Island. The nursery grows 12 million containerized seedlings per year.

Sowing—The key to a successful nursery operation is an efficient seeding operation. Strathlorne Nursery has invested large amounts of time and money on research and extra staff to lower seed usage as much as possible. The current seed usage, on average, is 1.2 seeds per cell; high value seeds, such as Norway spruce, are single seeded.

The seeding operation involves a variety of steps, requiring both mechanized and human labour. Jiffy pellets are shipped “ready-to-sow” on pallets directly from the factory. These containers are positioned in a seed line operation, where a template is placed over the pellets to direct seeds into the cavity for germination (Figure 3). Prior to sowing, the seeds are coated with a paint pigment to make them easier to see during inspection and during any necessary hand sowing. All seeding, for both Jiffy pellets and Multipots, undergoes inspection and hand seeding prior to the placement of containers in the greenhouses. This has reduced seed usage by 40%, and has resulted in a dramatic reduction in thinning and transplanting costs.



Figure 1—Seedling grown in a Jiffy pellet.



Figure 2—Multipot 2-67™ hard wall containers.

Following seeding, the pellets are run through a fine water spray so the seeds will “stick” in the cavity. The pellets are then placed into a growing container at 2 pellet sheets per container (Figure 4). A light coating of very fine vermiculite is placed over the seeds. This helps prevent the collapse of the seed cavity if a watering volume mistake occurs.

Seeded trays are moved to the greenhouses on electric conveyors and placed on racks for germination and culturing.

Extended Greenhouse Culture—All crops in eastern Canada use “Extended Greenhouse Culture” (Colombo 1997). Crops are held in greenhouses at elevated temperatures until early November. At the end of the growing season in early November, all crops are tested at the University of New Brunswick for cold hardiness. Two successive tests at



Figure 3—Initiation of seeding operation, with template placed over the Jiffy pellets.



Figure 4—Jiffy pellets placed into a container for transport and culture in the greenhouse.

–15 °C (5 °F) are done prior to moving crops out of the greenhouse. If cold hardiness has reached an acceptable level, seedlings are moved outside for overwintering.

Greenhouse crops are moved on multiple layered wagons to holding areas for overwinter protection (Figure 5). This reduces the number of tractors and wagons required to move crops.



Figure 5—Transport of seedlings to overwinter holding areas on multiple layered wagons.

Overwintering Methods—

Pallets and Plastic. The most successful method for overwintering seedlings at Strathlorne Nursery has been a combination of pallets and plastic. Root growth potential tests have shown very good results with this method.

Following removal from the greenhouse, crops are placed on pallets for further hardening-off. For overwintering, the crops are placed on the ground with concrete blocks positioned throughout the crop. Pallets are then placed above the crop, supported by the concrete blocks (Figure 6). The crop is sealed with 6-mil white plastic (Figure 7); the plastic is attached with wooden strips, with the edge of the plastic covered with gravel to hold it in place.

The plastic remains on the crop until late March or early April of the following year. The rule of thumb used for the timing of plastic removal is to begin the process when the plugs are completely thawed in the spring.

Cold Protection Fabric. An alternative method to the plastic and pallets is the use of a cold protection fabric placed



Figure 6—Pallets supported by concrete blocks over the crop for overwintering.



Figure 7—Covering the crop with plastic for overwintering.

directly over the seedlings. Arbor Pro, a product made in Quebec, is a fabric similar to felt that comes in different thicknesses. The fabric used at the nursery is approximately 0.19 in (0.5 cm) thick. The fabric is pulled over the crop and held in place with concrete blocks along the edges (Figure 8).

Packing and Shipping—

Root Pruning. Root pruning for seedlings grown in Jiffy pellets must be done at least 3 weeks prior to shipment for planting. White and Norway spruce seedlings are usually cut in late summer or early fall to ease the workload in the spring. Black and red spruce seedlings are pruned prior to shipment. In the past, root pruning was done on a manual jiffy cutter. This process is now accomplished on a newer electric dual cutter.

Grading. Crops that cannot be shipped “as is” are subjected to a grading process prior to shipment. The quality rule in Nova Scotia is that 90% of the tree seedlings in a container must meet quality standards for height, root collar diameter, green foliage, free of insect/disease, and so on.



Figure 8—Arbor Pro recently removed from crop. Note that no damage has occurred to the crop. Although laid over from the weight of snow, the seedlings will stand up within a couple of weeks.

Grading at the nursery is done on the old bareroot grading tables, with a conveyor added to move the containers to the graders. The graded trays are placed on pallets inside the grading room, pushed outside to a holding area awaiting shipment, and then moved by forklifts for loading.

Shipment. Shipment to the planting sites is accomplished by using 5 ton trucks and tractor/trailer units. The capacity of the 5 ton trucks is 80,000 seedlings. However, the nursery has recently purchased a “Kentucky” trailer, which has a series of 7 doors down the side; the maximum distance to unload trees is 8 ft (2.4 m) versus 50 ft (15 m) in a regular trailer (Figure 9). The capacity of this unit is 260,000 seedlings.

New Brunswick Nursery Operations

In 2002, 65 million trees were planted throughout the province. Approximately 30% of the seedlings were grown in Jiffy pellets; the remaining 70% were grown in Multipot hard wall containers. More Multipots are used in New Brunswick than Nova Scotia, as 1 large industrial nursery grows 32 million Multipot seedlings per year.

All seeds sown in New Brunswick nurseries originate from seed orchards. Second generation seeds are used for black spruce and *Pinus banksiana* (jack pine); first generation seeds are used for all other species.

Kingsclear Forest Nursery

Kingsclear Forest Nursery is operated by New Brunswick DNR, and is located in Fredericton, NB. The nursery grows 18 million containerized seedlings per year in 3 separate crops; all seedlings are grown in Jiffy pellets.

Sowing is a mechanized operation. Mechanized sowing involves 2 separate seeding heads to allow prills of slow release fertilizer to be placed in the cavities along with the seeds (Figure 10).

Culturing and seedling transport are also mechanized. Greenhouses are built with additional doors at the ends to allow pallets to be pushed out these doors and moved by



Figure 9. “Kentucky” trailer for hauling seedlings.



Figure 10—Container seed drill with double heads for addition of slow release fertilizer to cells.

equipment. Pallets are placed outside in holding areas for continued growth. Shadehouses are used to condition crops moved outside during the heat of summer, with products such as Chic-o-pee used during the conditioning.

Two methods of overwintering are used at the nursery: 1) trays can be placed directly on the ground in holding areas (approximately 50 ft [15 m] wide) cut into the woods—this allows for snow cover during the winter months; and 2) trays may be placed on the ground in the greenhouse—pallets are then placed over the crop and the plastic cover is removed from the greenhouse.

JD Irving, Ltd

JD Irving, Ltd, operates a large industrial nursery in New Brunswick, growing 32 million seedlings per year (all in Multipots). It is a highly mechanized operation, with large machinery for almost all tasks. The average greenhouse is 300 ft by 85 ft by 35 ft high (91 m by 26 m by 11.5 m). Large machinery is used to place crops into the greenhouses. During the growing season, energy curtains are drawn and night break lighting is used in the greenhouses.

The thinning/transplanting operation is one of the few procedures where human hands actually contact the seedlings.

Transport of seedlings to holding areas is done with specialized machines (Figure 11). Frost protection in these holding areas is entirely automated, with curtains used to cover the crops when necessary (Figure 12).

For overwintering, the crop is removed from pallets and placed on the ground. Snow cover is used for overwinter protection. If natural snow cover is not available, snow-making machines are available (Figure 13).

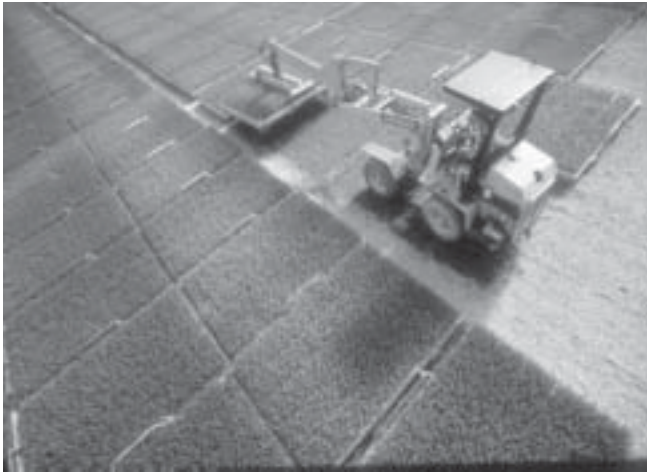


Figure 11—Transport of the crop to holding area.



Figure 13—Snowmaking equipment for overwintering seedlings.

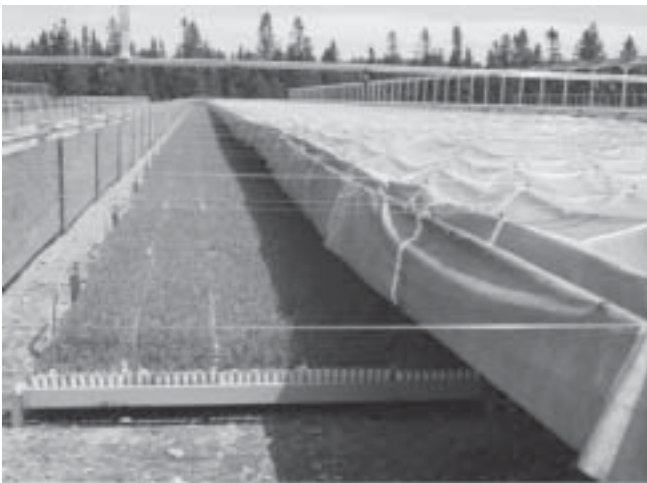


Figure 12—Automatic frost protection system.

Tractor trailer units are used to move seedlings to the planting sites. The containers remain on pallets for shipment to these sites. The driver can do all the loading and unloading, with no other crew required.

References

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