

Example of a Typical Propagation Protocol

Species: Bur oak, *Quercus macrophylla*

Ecotype: North Dakota

Outplanting Site: Northern Great Plains

Outplanting Date: April to May

TARGET SEEDLING INFORMATION

Height: 10 to 18 inches

Caliper: 4 to 6 mm

Root System: Firm root plug

PROPAGATION AND CROP SCHEDULING

Propagation Environment: Fully-controlled greenhouse

Propagation Method: Seeds. Sowing germinants.

Source of Propagules: Collected by hand from Turtle Mountains. ND.

Pretreatments: Float test acorns in water and use only sinkers. Dip acorns in a fungicide solution (Captan) to reduce mold during stratification. Place wet acorns in a plastic bag in a refrigerator for 180 days of cold, moist stratification at 0 to 2 °C (32 to 36 °F). Remove acorns from refrigerator 4 to 5 days before sowing and rinse to remove fungicide. Place acorns in tubs and cover with plastic sheeting to retain humidity. Fill tubs 1/4 to 1/3 full and place in a warm environment [60 to 60 °F (16 to 19 °C)] to stimulate rapid germination.

Container Type and Volume: Bur oak requires big containers with large cavities to accommodate the large acorn and they also need to be widely spaced to permit good caliper development. The Spencer-Lemaire Tinus Roottrainer® has a top opening of 3.8 x 5.1 cm (1.5 x 2.0 in.) and is 18.5 cm (7.2 in.) deep. The cavities are 350 cm³ (21.5 in³) in volume with a cell density of 516 cells/m² (48/ft²). Another good container for this species is the Colorado Styroblock which has a top opening of 5 x 5 cm (2 x 2 in.) and is 20 cm (8 in.) deep. These cavities are 492 cm³ (30 in³) in volume with a cell density of 270/m² (25 ft²).

Growing Media: 50% *Sphagnum* peat moss and 50% #2 grade vermiculite. Fill cavities and tamp lightly to remove air pockets. Use a large pointed dibble board to make room for the germinating seeds.

Total Time to Harvest: 12 months. including freezer storage.

Example of a Typical Propagation Protocol (continued)

Sowing Date: March 1

Sowing/Planting Technique: Irrigate filled containers to saturate growing media. Remove germinating acorns and place one germinant in each container. Sow at 1 cm (1/2 in) depth and be sure to orient the radicle downwards to prevent abnormal stem crooking. Cover germinants with a shallow layer of perlite.

Establishment Phase: Keep the greenhouse warm and humid both day and night (see following schedule). Frequent misting is all that is needed to keep the media "moist, but not wet" until the primary leaves have developed. Fertigate with a low nitrogen (100 ppm) but well-balanced fertilizer solution twice per week. Keep leaves dry to avoid fungal pathogens. Bur oak seedlings can tolerate full sunlight so shading is not necessary. Photoperiodic lighting is required to keep the seedlings actively growing. Turn on the carbon dioxide generators as soon as the primary leaves develop and set it to come on about 4 hours before sunrise.

Rapid Growth Phase: After the seedlings are well established in the container, the day temperature range can be increased to 24 °C (75 °F) to 32 °C (90 °F) to promote multiple flushing. Bur oak grows in a series of up to 4 flushes of similar height. The relative humidity should also be kept high to minimize moisture stress. As the leaves increase in size, irrigation will become more difficult because a high percentage of the applied water is intercepted and never makes it into the growing medium. Therefore, the duration of each irrigation and the number of irrigations per week must be increased accordingly. Although it is simplest to wait to irrigate until the foliage begins to wilt, monitoring the weight of the containers is the easiest way to keep the growing medium in the ideal moisture range. Fertigate with a high nitrogen (200 ppm) but well-balanced fertilizer solution twice per week to keep all essential mineral nutrients at optimum levels.

Hardening Phase: As the individual containers of seedlings reach their target height, they are moved to the shadehouse in late summer. Removing these larger plants also opens up the canopy and makes irrigation easier. All seedlings will have been moved by mid-August to begin hardening under ambient conditions. The seedlings should be placed on raised benches to continue encouraging air pruning of the roots. The change to lower humidity and natural photoperiod will help trigger the hardening process but you also should switch to a hardening fertilizer formula with a reduced nitrogen level of around 50 ppm. This should be applied as long as day temperatures are above freezing and the root plugs remain unfrozen.

Harvest Date: Late October

Storage Conditions: Seedlings are extracted from the containers and grouped with the rootballs wrapped in cellophane. The bunches of seedlings are placed in a cardboard box with a polyethylene bag liner, and the boxes moved to freezer storage at -4 to -6 °C (20 to 25 °F).

Storage Duration. The oak seedlings will remain in freezer storage until shipment the following Spring. One week prior to shipping, the temperature in the freezer should be raised to 2 to 5 °C (35 to 40 °F). Individual boxes can be removed from the freezer and thawed at ambient temperatures for quick shipping orders.

Propagator:

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