WINTER STORAGE OF SHRUBS FOR TIMELY SPRING SHIPPING

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Only healthy plants should be placed in cold storage because quality of the stored material does not improve. Each species should be checked during and after the storage period to insure high-quality plants and to prevent future problems.

To produce high-quality shrubs for distribution at the proper planting time, fall or winter lifting of plants may be necessary. To insure high-quality stock for spring planting, good cold storage and careful handling of seedlings are important.

Abbot and Eliason (*1*) reported that 29 nurseries in the United States practiced some kind of winter storage of nursery stock. Twenty-one of these had refrigerated areas. The average temperature maintained in these areas was 34°F, slightly above freezing. Nyland (*2*) suggests several very important factors to be considered in cold storage of northern conifers. Included are the importance of using dormant stock, care in lifting and storing of that stock, and maintaining the temperature in the storage area just above the freezing point.

The Soil Conservation Service, U.S. Department of Agriculture, operates plant materials centers for the production and evaluation of conservation plants. One of the plant materials centers is located at Cape May Court House, N.J. Facilities at this center include a controlled refrigerated room for winter storage of plants. A record-keeping procedure was started in 1972 to determine the quality and effect of the storage on plant survival and growth of several shrub species.

Methods And Procedures

The storage facility at the Cape May Plant Materials Center consists of a 28-ft by 12-ft insulated room with temperature and humidity controls. Temperature within the storage area ranged from 31° to 39° F. A 4-hour time cycle consisted of 3 ½ hours gradual warming from 31° to 39° F followed by a rapid decrease in temperature. The relative humidity (RH) was maintained between 94 and 100 percent. Deciduous plants were considered to be dormant when they had dropped their leaves. Dormancy for other plants was determined after several days of below freezing temperatures.

The dormant plants were carefully lifted and sorted. Only the healthy plants in good physical condition were selected for storage. These plants were washed to remove any remaining soil from the roots. The clean plants were tied with nylon twine into bundles of 25 or 50. A benomyl mixture consisting of ½ pound of Benlate[1] per 100 gallons of water plus a spreader-sticker was used as a prestorage fungi dip. The bundled plants were stored in the temperature- and humidity-controlled room until planting time. Damp peat moss was used to cover the bare roots to prevent excessive drying.

Plant quality was determined in the spring by lining out 20 plants of each stored species. The planting dates coincided with the recommended planting dates for each species. Survival counts and leaf unfolding dates were recorded.

Observations

On the basis of observations during storage and results after the plants started growing, we can make the following comments:

A. Careful lifting of the dormant stock to avoid mechanical injury to the plants is a prerequisite to successful storage. Bruised or scarred plants are more likely to be affected by mold and other fungi than are uninjured plants.
B. Some shrubs, such as sumac (*Rhus s*pp.) and rugosa rose (*Rosa rugosa*), are pithy and do not store well for long periods of time. It is difficult to decide when to dig and store amur honeysuckle (*Lonicera maackii*). Under southern New Jersey conditions amur honeysuckle may drop its leaves while basal buds are beginning to grow.

[1]Trade names are used solely to provide specific information. Mention of a trade name does not constitute a guarantee of the product by the U.S. Department of Agriculture nor does it imply an endorsement by the Department over comparable products that are not named.

C. Benomyl is an effective pre storage treatment for reducing mold in storage. Dipping only the ends of bundles (roots and cut tops) resulted in fewer mold problems during storage than treating the entire bundle. The excess water did not drain away readily and bundles stored in a saturated condition tended to mold more rapidly than those that were well drained.

D. Saturated air (99-100% RH) is adequate for protecting the live roots. Exposed roots require protection to prevent excessive drying during the warming cycle in the storage room. Thin layers of benomyl-treated, damp, peat moss were used to protect the plant roots during storage.

E. Continual and close inspection is necessary to detect problems before they spread throughout the entire storage area. During the first year of the study, heavy infestation with a fungus (Botrytis) occurred. Infected bundles were removed from storage and dipped in the benomyl solution, then restored and sprayed with benomyl 10 days later.

F. Continuous air circulation is beneficial. This decreases the mold problem and maintains a more uniform temperature and relative humidity.

G. All species tested except rugosa rose (table 1) had good survival after winter storage.

H. Bayberry (*Myrica pensylvanica*) is slow to leaf out in the spring. Stored bayberry plants recover slowly. Table 2 shows results obtained after 90 days of storage.

Literature Cited

1. Abbott, H.G., and Eliason, E.J. 1968. Forest tree nursery practices in the U.S. J. For. 66:704-711

2. Nyland, R.D. 1972. Over-winter cold storage and its use in New York state. Presented at Ministry of Natural Resources Provincial Nurserymen's Meeting, Barrie, Ontario.

Table 1. — *Survival of plants held in cold storage at Cape May Plant Materials Center*

Species	Average Percent Survival	Number of Years
'Cardinal' autumn olive *Elaeagnus umbellata*	100	3
'Rem-Red' amur honeysuckle *Lonicera maackii*	100	3
NJ-1108 bayberry *Myrica pensylvanica*	91	3
NJ-1568 Virginia creeper *Parthenocissus quinquefolia*	100	2
NJ-496 beachplum *Prunus maritima*	98	3
NJ-496 aromatic sumac *Rhus aromatica*	89	3
NJ-497 flameleaf sumac *Rhus copallina*	89	3
'Arnot' bristly locust *Robinia fertilis*	94	2
NJ-973 rugosa rose *Rosa rugosa*	78	2

Table 2. — *Effect of cold storage on leafing-out of bayberry*

Date of Observation	Observations: Planted 1/29/75[1]	Observations: Planted 5/3/75[2]
5/13/75	Leaves opening	no leaves
5/30/75	85 percent of plants leafed out	no leaves
6/6/75	90 percent of plants leafed out	50 percent of plants leafed out
6/18/75	90 percent of plants leafed out	80 percent of plants leafed out
6/27/75	90 percent of plants leafed out	85 percent of plants leafed out

[1] Plants were lifted from seed bed and planted on same day.

[2] Plants were lifted 1/29/75 and stored until 5/3/75 when they were planted.

Figure 1. — *As a check on plant quality, 20 plants of each species were lined out at the plant materials center when the others were shipped to the field.*