WINTER PROTECTION OF CONTAINER PLANTS[1]

FRANCIS R. GOUIN

Department of Horticulture
University of Maryland
College Park, Maryland 20742

Over the years nurserymen have used numerous methods for overwintering container-grown woody ornamental plants. In areas where snow is plentiful and early, ornamentals are overwintered by laying the plants on their sides before the first snow-fall. Where winters vary from moderate to severe and where early winter snows are unpredictable, nurserymen have had to adopt other methods of winter protection. Deep cold-frames have been used by a limited number of growers with a high degree of success. A modified version of the deep cold-frame being used by some growers is a wide open trench, dug 18 to 24 inches deep in a well drained soil on a gentle slope facing north. The plants are packed tightly in the trench and mulched with sawdust, shavings, ground-bark, or wood chips.

Few growers have had 100% success over-wintering plants by packing them together on level ground and covering the containers with mulch. Peripheral containers generally become uncovered before and during the most severe parts of winter.

To overcome the high labor cost of mulching, many growers have constructed unheated plastic greenhouses covered with clear, white or aluminized polyethylene. In late fall the plants are packed container to container or stacked on the floors of these houses and watered thoroughly. The houses are generally kept tightly closed during the winter except for prolonged periods of high temperatures. Growers who have continued to experience repeated failures in over-wintering certain species have solved their problem by mulching the plants within these shelters, have installed heaters to maintain temperatures above freezing, or have discontinued container production. With our growing energy crisis, it is doubtful if fuels will be available for this purpose.

In areas where winters are not severe, some growers over-winter container plants by laying the plants on their sides and covering them with white or aluminized polyethylene, shade cloth, burlap or straw.

The winter survival of container-grown ornamental plants is dependent on many factors: root hardiness, soil moisture, wind, minimum temperatures, and fluctuating temperatures. The mulching of containers protects the roots from minimum and

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rapidly fluctuating temperatures while frequent irrigations insure the roots adequate moisture and increases soil temperatures. Deep-shaded cold-frames protect both the tops and roots of the plants from minimum temperatures, minimize fluctuating temperatures, protect plants from drying winds and sun, and reduces water losses from evaporation or transpiration. Unheated plastic greenhouses protect the plants from rapid fluctuating temperatures, drying winds and sun, and excessive loss of moisture. Unheated greenhouses, however, do not protect plants from cold damage if subfreezing ambient temperatures occur (1). Laying the plants on their sides reduces the amount of foliage and stems exposed to wind and sun, resulting in less water lost by evaporation and transpiration; while the covering of the containers and plants with tinted polyethylene, shade cloth, burlap, straw or snow further reduce water losses, and minimizes temperature fluctuations.

The winter survival of container-grown ornamentals has generally been evaluated by the appearance of the plants in the spring. If evergreens still retain their green leaves and if deciduous trees and shrubs sprout new shoots, the plants are considered to have survived the winter without injury and the overwintering system is considered adequate. However, just because the top of the plant is alive does not mean that the plant has survived the winter months without injury. Roots of *Ilex crenata* along the outer edge of the root-ball are killed by temperatures of 20° F/ (1, 2). It has also been observed (4) that tissues of *Taxus cuspidata* roots near the base of the rooted cutting are more cold hardy than are primary tissues near the root tip. The heavy loss of roots along the periphery of the root-ball, then, would not necessarily result in death but could delay and reduce spring growth. It is this type of winter injury the nurserymen may not be aware of.

Nurserymen growing plants in containers should be aware of a short but important list of root-killing temperatures compiled by Havis (2). Depending on species, root-killing temperatures vary from 23° to 0°F. Because of the wide range among species in root killing temperatures, nurserymen should segregate the plants with high root killing temperatures that require maximum root protection from those plants that will tolerate root temperatures of near 0°F. Plants with the hardier roots require minimum winter protecting methods.

It is possible to provide maximum winter protection with minimal labor and without having to build over-wintering structures by covering the plants with Microfoam and polyethylene. This method has been tested successfully during the winters of 1971-72, and 1972-73 in Maryland.

The Microfoam[2] currently being recommended is 25GPS-1/4". It is 1/4" thick and comes in rolls 225 ft long and 4 ft wide. It is mildew and fungus resistant and remains flexible over a temperature range of -320° to 250°F. Its important nursery properties are: Thermal insulator with a coefficient thermal conductivity of 0.27 BTU/hr/ft²/°F/inch, and its low bulk weight of 0.7 lbs. per cubic foot; the 25 GPS-1/4" permits 50% light transmittance. It can easily be spliced together with pressure tape to make wider blankets. If Microfoam is handled with care and stored in the dark when not in use, it should last 3 years or more.

The procedure currently being recommended to Maryland nurserymen over-wintering plants under Microfoam are:

1. Do not begin covering plants until minimum temperatures lasting several hours approach root killing temperatures. In central Maryland this is sometime around Thanksgiving.
2. Twenty-four hours before covering, irrigate the plants thoroughly.
3. In a well drained area lay the plants on their sides with the foliage laying over the pots. Pack the plants as closely as possible to conserve space.
4. Cover the plants with a single layer of Microfoam making certain that the edges touch the ground on all sides.
5. Cover the Microfoam with a single layer of clear polyethelene and seal the edges to the ground with soil.
6. In Maryland, plants are generally uncovered between March 1 to 15 depending on minimum temperatures.
7. If mice or other rodents are a problem, scatter a few mothballs around the plants before covering.

Air temperatures measured beneath the blanket on February 12, 1973 averaged 30°fi when the ambient air temperatures was 3°F. Temperature differentials were similar in 1972 studies. Root examinations immediately after uncovering and again one month later revealed that the plants had not suffered root loss. The following species have now been tested and are recommended for this method of over-wintering: *Ilex crenata*, *I. opaca*, *I.* x 'Foster No. 2', *I. cornuta*, *Buxus sempervirens*, *Prunus laurocerasus*, *Pieris japonica*, and *Pyracantha coccinea* 'Lalandei'. At present, the only plants not recommended are the evergreen azaleas. Azaleas over-wintered under Microfoam were serverely defoliated

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[2] Supplied by the E I DuPont De Numours & Co (Inc) Film Department, Wilmington, Del 19898

by *Botrytis*. It may be possible to overcome this problem with a systemic fungicide.

The difference in growth at the end of the second growing season between a plant over-wintered under Microfoam and one over-wintered in an unheated plastic shelter is shown in Figure 1.

Figure 1. Two-year-old *Buxus sempervirens* plants in 8" containers with identical growing medium, fertilizer and irrigation in 1972 and 1973, but: Left — over-wintered under 25GPS-1/4" Microfoam and 4 mil poly; and, Right — over-wintered in an unheated plastic-covered shelter.

LITERATURE CITED

1. Gouin, F.R. 1969. The influence of cultural practices and growth regulators on the over-wintering of container-grown woody ornamental plants. University of Maryland Ph.D. Thesis.
2. Havis, J.R. 1972. Winter Injury. Nursery Container Production. Cooperative Extension Service, University of Massachusetts, Publication #73. pp. 35-37.
3. _____, R.D. Fitzgerald, and D.N. Maynard. 1972. Cold-hardiness response of *Ilex crenata* Thumb. cv. Hetzi roots to nitrogen source and potassium. *HortScience* 7(2):195-196
4. Mityga, H.G. and F.O. Lanphear. 1971. Factors influencing the cold hardiness of *Taxus cuspidata* roots. *J. Amer. Soc. Hort. Sci.* 96:83-87.

JOHN ROLLER: What is the cost of that material?

FRANCIS GOUIN: Right now it's 2-1/2 to 3 cents/ft. I have some material that is 3 yrs old that was rolled up and stored in

the dark after each use. It does have to be handled carefully or it will tear.

DON EMBREE: Do you find any difference if the foliage is laid under rather than over the container.

FRANCIS GOUIN: Yes, if it is laid under the container we get foliage rot; if it is laid over, the plants come out in excellent condition.

PRESIDENT TUKEY: Thanks to all our speakers for an excellent morning's program.

WEDNESDAY AFTERNOON SESSION
December 5, 1973

The afternoon session convened at 1:35 p.m. in the Saddlebrook-Washington Rooms. Mr. Ralph Shugert served as moderator.

SEEDLING PROPAGATION SYMPOSIUM

RALPH SHUGERT

Spring Hill Nurseries
Tipp City, Ohio 45366

We are fortunate to have five members who will share their expertise with us in the vast and complex field of seedling propagation. To illustrate the point, in Vol. 20 of the Proceedings, G.B.&I. member McMillan-Browse said, "Little information has been forthcoming on the propagation of viburnums from seed and all that comes to light from surveying the literature is confusion!" I can well appreciate his statement because all of us who have attempted sexual propagation of various species will understand the "confusion". In reviewing the literature for a background of a Seedling Propagation Symposium, there is data available in virtually all of the 21 volumes of our Proceedings. As I mentioned to the Manitoba nurserymen on Thanksgiving of this year, we must read all available data — and then learn from practical experiences.

For the information of our new members and guests, I hold the office of Historian on the I.P.P.S. Board, and in my files I have the Proceedings of the National Association of Propagating Nurserymen for their June 23, 1926 meeting held in Louisville, Kentucky.

P.W. Zimmerman from the Boyce Thompson Institute presented a paper on seeds and seed germination in which he care-