EASTERN OVERWINTERING STRUCTURES

RICHARD BOSLEY
Bosley Nursery
Mentor, Ohio 44060

Lake County, Ohio, is located along the south shore of Lake Erie and about 25 miles east of Cleveland. There are several conditions which cause a concentration of over 200 nurseries in this smallest county in Ohio. The lake has a strong influence on our weather, the great glaciers deposited a variety of soils and we are in the middle of a giant market area.

Since many of you are interested in the rhododendron, I must mention that Lake County produces 500,000 new rhododendron plants a year, according to an estimate by Dr. Hoitink of the Ohio Agriculture Research Center. Dr. Hoitink has taken quite a personal interest in the rhododendron and has done a lot of research in the area of disease prevention, for which we are all grateful. He has also been largely responsible for the development of extensive test and display gardens at the Wooster, Ohio, Center.

The Holden Arboretum, also in Lake County, is the largest arboretum in the world by a large margin and they have recently spent $100,000 dollars to develop a rhododendron collection. This was spent for developing the area alone!

Last year my father donated to the Lake County Metropolitan Park District 14 large Dexter hybrid rhododendrons. Each of these plants is unique and none of them have ever been in the trade. I am pleased that these will be available for future generations to see. These most hardy plants that Mr. Dexter developed will bloom heavily after —20° F to such an extent that you can hardly see the leaves. They are planted in a beautiful forest setting and we hope to expand the plantings in the future. The well known rhododendron breeders, Dr. David Leach and Tony Shammarello, reside and carry on their work here also.

With this background I would like to consider winter protection of container plants. If you have been a member of this Society you will find many papers on this subject in the Proceedings over the past years. It has been an evolutionary matter but perhaps the greatest turning point, for me, was a talk given by Harrison Flint (1) at the Eastern meeting of the IPPS in Mobile, Alabama, in 1967. He said in part . . "root hardiness has been measured in only a few species but in these cases roots usually have been found to be more tender than hardened stems of the same species." If you are thinking of switching from field growing to container production try to obtain this volume of the Proceedings and read the article.

At first our protection was mainly one of keeping the winter wind and sun off the plants. With the realization of Mr. Flint's fine

work our structures took on the shape, size and expense of greenhouses. Today at my nursery the structures are double covered which saves about 40% on the heating bill and makes the house much more wind resistant. Each house has full electric service, piped in natural gas and a year round operating water system. The experiences I have had over the years with polyethylene has been less than good so that today I use the very best two-year film that I can get and throw it away after one winter in the hope that it will survive the high winds and bitter cold that we always get.

This past year I observed an interesting event. Most of my poly houses were covered with two layers of four mil Co-polymer white film but two houses had a variation. One had the outer layer clear and the inner white while the remaining one had the reverse. There was quite a difference in the light and heat on a bright day with these three variations. If the light meter showed 100 foot candles in the house with two layers of white it would show 200 f.c. in the one with white on the outside (clear inside) and 400 f.c. in the house with clear out and white in. There was a similar heat relationship. I don't know why reversing the two outer layers should make such a difference — but there was. Perhaps other growers can somehow use this to their advantage. The houses were oriented east and west on their long axis and were inflated with air between the sheets with about ¼ inch of water pressure.

Several years ago I realized that covering wasn't sufficient insurance that plant roots would not be injured and so heaters were installed. The units I use are furnace conversion burners used to change household coal furnaces to gas.

They are fully automatic and are controlled by a thermostat which also switches on a blower that distributes the heat through the 135 foot house. Products of combustion are retained in the house and adequate fresh air must be provided by propping the door open to prevent flame-out from lack of oxygen on cold nights. There are certain potential hazards with this heating approach and I am not suggesting that others use this method but only reporting what I have done. The system works well while keeping the cost within reason. There are many types of heaters that can be used. I find that it requires 70,000 BTU / hr / night to keep a house that is 14 ft x 135 ft, double covered, at 35 degrees when it is zero outside with a 50 m.p.h. wind blowing.

The products of complete combustion from natural gas are carbon dioxide and water vapor. If there isn't enough oxygen present the heater can then produce carbon monoxide plus unburned gas, which can cause defoliation of some crops.

The conditions we have within these winter cover structures are perfect for the spread of *Botrytis*; that is, high humidity and above-freezing temperatures. Many of the methods used in greenhouses do

not work at these low temperatures but we have been using a method for several years that is very good, on at least the red rhododendrons that I grow. It is 1 lb Terraclor (75% WP) and 2 lbs. Captan (50% WP) in 100 gallons water sprayed on the plants once before they are covered and then about once a month during the covered period or as needed.

This really works but I would caution you not to use it on young growth or at elevated temperatures, such as you would have in a greenhouse. Try it on a small scale first. It appears that the Captan kills most of the organism present and then they do not seem to reform on a surface that has Terraclor on it.

The only thing I am sure of is that we would not recognize today what we will be doing in the field of winter protection five years from now. The structures we are using now can yield about $40,000 gross crop return per year per acre covered and I expect this figure to double in five years, due to better quality crops.

I always enjoy attending the Western Region Plant Propagators' Meeting, as the people here are so very friendly.

LITERATURE CITED

1. Flint, Harrison, 1967. Winter storage of young nursery stock. *Proc. Inter. Plant Prop. Soc.* 17:344—350.

MODERATOR McNEILEN: Thank you, Dick. Now Dr. Douglas Phillips, U.S.D.A. plant pathologist from Fresno, California will discuss control of geranium rust through heat treatment. Dr. Phillips:

HOT-WATER TREATMENT OF GERANIUM CUTTINGS

DOUGLAS J. PHILLIPS
U.S. Department of Agriculture
California Marketing Research Center
Fresno, California

Postharvest, hot-air or hot-water treatment of geranium cuttings offers a high or eradicative level of control of geranium rust incited by *Puccinia pelargonii-zonalis* Doidge with only slight injury to the cuttings, (Grouet, 1965) (Phillips and McCain, 1972). Our initial work indicated that hot-water treatment at 122° F for 90 seconds also gave some control of other cutting-borne pathogens that are im-