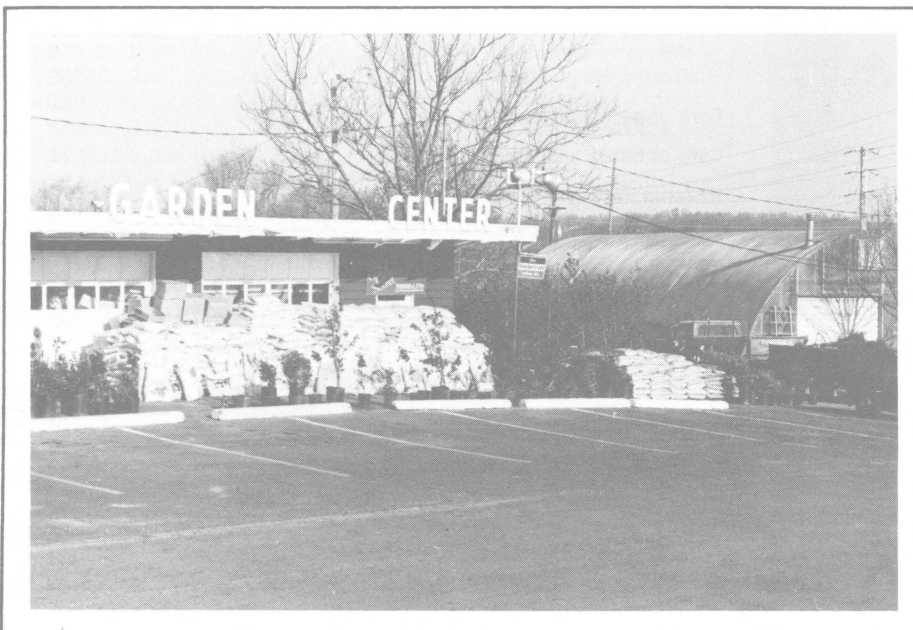


# Care of Nursery Stock in Retail Outlets



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**Cover Photos:** Types of retail outlets.

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## Contents

<b>Importance of nursery stock care</b> .....	3
<b>Forms of nursery stock</b> .....	3
Balled & burlapped (B. & B.) .....	3
Peat balled (P. B.) .....	3
Container .....	4
Packaged (root wrapped) .....	4
Bare root (B. R.) .....	4
<b>Environmental conditions influencing nursery stock care</b> .....	4
Moisture .....	4
Light .....	6
Temperature .....	7
<b>Care of rose stock</b> .....	7
Potted roses .....	7
Packaged roses .....	7
<b>Care of general nursery stock</b> .....	9
Handling nursery stock .....	9
Maintaining labels .....	9
Fertilizing nursery stock on sales display .....	10
Weeds in nursery stock .....	10
Overwintering nursery stock .....	10
<b>Care of perennial flower plants</b> .....	11
<b>Care of hardy bulb stock</b> .....	11
<b>Hazards in retailing nursery stock</b> .....	12
Freeze damage .....	12
Heat wave .....	12
Drying damage to evergreens .....	12
Plastic twine and wire .....	13
Plastic burlap substitute .....	13
Other hazards .....	13
<b>Check list of supplier's responsibilities</b> .....	13
<b>Check list of retailers responsibilities</b> .....	14
<b>Summary</b> .....	14
<b>Sources of information</b> .....	15
<b>References</b> .....	15
<b>Glossary</b> .....	16

## IMPORTANCE OF NURSERY STOCK CARE

Good care of nursery stock by a retailer maintains sales appeal, value and viability. In the absence of good care, all three of these important features may decline, often all the way to zero!

Nursery stock in retail outlets is in an abnormal environment—usually not favorable for plants. The longer plants are held prior to planting, the greater the disadvantage and risk of failure to their survival and growth, unless they receive proper care.

Most nursery stock which fails to grow well has been adversely affected by the actions or neglect of man and fails for that reason rather than because of diseases, insect pests, or some mysterious physiological problem.

A retailer's guarantee that a plant will grow cannot be accepted as a substitute for safeguarding viability. The customer expects that his money, time and effort will not go for a lost cause and a lost opportunity to enjoy his choice of plants for that year, guarantee or no guarantee.

Under Ohio Law, only sound healthy nursery stock

stored or displayed under conditions which will maintain its vigor may be offered for sale\*. In Ohio, annual loss of nursery stock during the merchandising period has exceeded a quarter million dollars in value. Most of these losses could be prevented, because the care that nursery stock receives or fails to receive relates directly to its survival. Research and experience in the nursery industry has improved cultural and merchandising practices relating to proper plant care so that it is possible to be both efficient and practical in the care of nursery stock.

The purpose of this publication is to provide some of this information as well as basic general information on care of stock. The retailer of ornamental plants and the personnel who assist him can prevent most of the loss and de-vitalization of nursery stock in retail outlets by acquiring knowledge of the principles and practices pertaining to good care.

\* See reference 4 (Ohio Plant Pest Law, Sec. 927.67) under "References" at back of bulletin.

## FORMS OF NURSERY STOCK

Nursery stock in Ohio includes any plant sufficiently hardy to withstand the normal winter temperatures of this state. In most other states, the designation is essentially the same. Annual bedding plants, florist plants for indoor use, vegetable plants, and the non-hardy bulbs, corms, tubers, etc., are not included among items classed as nursery stock in Ohio. There is no legal requirement for inspection, or licensing of outlets of this material as there is for nursery stock. Due to pest risk, inspection of nursery stock is mandatory in all states and many countries, including all exporting countries.

Nursery stock is available to retailers in several forms, including balled and burlapped, peat balled, containerized, packaged, and bare-rooted (see illustration 1).

### Balled & Burlapped (B. & B.)

Evergreens, shrubs, and shade and flowering trees are sold in this form. The plants are dug with a soil ball intact and secured with burlap. The most important determinants of viability of this type of nursery stock are size of ball in relation to size of plant (Reference 5), and the safeguarding of the soil ball from damage or loss. B & B stock usually requires more protection from drying by frequent watering, mulching, or the use of plastic overwrap than does peat balled stock. However, B & B stock carries a certain degree of assurance of viability due to the protection the soil ball affords the undisturbed portion of the root system.

### Peat Balled (P.B.)

A popular method of packaging shrubs, shade trees and flowering trees is called "peat balling," or sometimes the stock is referred to as having a "processed ball." The process consists of applying to the roots a ball of peat, or bark, weathered sawdust or various mixtures of these and possibly other organic materials. Slow release fertilizer is often incorporated in the

organic mix. The ball of this mix is contained with burlap, which is usually treated to delay decomposition, or it sometimes is contained by other types of fabric or by plastic substitutes for the burlap. The applied ball is usually further protected with an opaque plastic overwrap to retain moisture. Viability of this form of stock depends on the adequacy of the root system in proportion to the size of the plant, and upon careful handling from field to customer. P.B. plants have the advantage of being lighter in weight than B & B stock, usually require less frequent watering and, if protected by opaque plastic, do not need to be mulched in the display beds. Peat balling often can be an advantage to the producer in that the work can be done in the winter months, using bare root stock from storage.



1. Forms of Nursery Stock. Left to right, balled and burlapped (B & B), peat balled (P B), container, packaged, and bare root (B R).

## Container

Container stock is a popular form of nursery stock because, in sales areas, it is more easily maintained and handled than other types of stock. Beside being more likely to survive than packaged stock, customers find container stock convenient and appealing. The appeal is often due to the fact that container stock is showing new growth at the time of sale.

Containers may be made of plastic, metal or fiber. Many kinds of fiber pots can be planted intact, since they readily decompose.

Container stock can be either of two types: (a) **Container grown** refers to a plant which has grown in its container for a period long enough for the roots to be well established through the soil and usually to the edge of the container; (b) **Dug and potted** refers to a plant which has been recently potted and has not been grown in its container. Potted roses are usually in this category, while trees, shrubs, evergreens and perennial flowers may be found in either category. Because of the rigors of transplanting, the survival risk is greater for the recently potted stock. A beneficial procedure in caring for such material includes placing it in an area where humidity can be kept high and protection from wind and bright sunlight can be provided for a week or more after potting or until root growth has begun. Areas such as inside a building, lath house, specially constructed beds, or behind a windbreak are suitable for protection.

A special category of dug and potted stock is termed, **Field Potted**, in which stock is dug with a soil ball intact and then placed into a container instead of into burlap, as with B & B stock. Such material carries less transplanting risk than material dug bare root and potted, and compares favorably with B & B stock.

Purchasers of container stock might well be cautioned that the root system of plants produced in a light medium (bark, peat, perlite, sand, etc.) may not readily grow into a heavy clay soil when the plant is permanently located. An answer to this problem of breaking down the "interface" between the root ball

and the native soil is to incorporate organic material such as bark, peat, compost or other soil conditioner with the backfill. These materials dilute the clay soil and cause the formation of aggregates, providing a condition more conducive to root growth away from the original root ball and into the surrounding area where resources of moisture and nutritional ingredients are more widely available.

## Packaged (root wrapped)

All kinds of nursery stock are packaged for sale; however, only the smaller sizes of trees, shrubs and evergreens lend themselves well to marketing by this method. Risk of loss is relatively high with this form of stock because the plant has been removed from the soil or other growing medium and the packing materials used to keep the roots moist usually do not provide good nutritional support for root growth. Therefore, the environment is suitable only temporarily, with the time period varying considerably among different kinds of plants. The popularity of packaged stock is due to its lower cost, light weight, and convenience in handling. It can, in most cases, provide satisfactory protection of root systems for short term merchandising.

## Bare Root (B. R.)

Bare root stock is shipped without any packaging beyond that which is necessary to protect it en route. The retailer can see exactly the condition of the entire plant including the root system at the time it is received. Some retailers are equipped to package or to pot such material themselves. If so, they can effect savings on cost of plants and shipping cost, and they are able to utilize their own labor for the packaging or potting work. Not all kinds or sizes of nursery stock can be moved safely as bare root material, but for those that can, the prices are less than for the same plants marketed in other ways. In retailing, greater losses can be expected from bare root stock, thus accounting for a decrease in its use.

# ENVIRONMENTAL CONDITIONS INFLUENCING NURSERY STOCK CARE

## Moisture

The most common method of supplying moisture for nursery stock that is displayed for sale is through sprinkler irrigation. Rainfall may, of course, be helpful in lessening the amount of irrigation needed, but showers or light rains usually are insufficient unless an inch or more occurs per week. Irrigation may be provided through portable oscillating or revolving sprinklers, perforated sprinkler hose and other watering devices. These methods are far superior to hand sprinkling with a hose, not only because of labor costs, but because a person's native impatience usually results in some stock, especially B & B material, being inadequately watered. For container stock, however, a hose and wand with breaker are satisfactory in the hands of a conscientious person who understands watering requirements.



2. Permanent Overhead Sprinkler System.

Watering nursery stock with a permanently installed overhead sprinkler system is more efficient and less expensive than hand watering.

### **Determining When and How Much to Water**

The appearance, the feel, and the weight of soil are the usual criteria for judging watering need or adequacy.

Moist soil has a darker color than dry soil. When it is possible to see the soil, the appearance is an indicator along with other factors but is not completely dependable in itself, because it may reveal the moisture condition on the surface only.

Feeling the soil is a good test, as it is possible to feel even small amounts of moisture due to the cooling effect from evaporation.

The weight of a plant with its root system and surrounding soil medium is a very satisfactory means of judging watering need, when it is possible to contrast weight differences. When light soil mixes are used for container stock or peat balled stock and organic materials for packaged stock, the weight difference between moist and dry material is great, several pounds in cases of larger stock. With B & B stock or container stock in clay or sandy soil, adding water only makes a heavy item a bit heavier. The difference is not easily judged by simply lifting.

To really know the moisture content of soil at or near the center or bottom of the root-soil mass, it is necessary to sample it at these places. Container grown stock can be knocked out, permitting one to feel or visually inspect the soil. Other forms of stock have to be probed to obtain a sample. Soil probes are made for this purpose, but without one, a knife, small trowel or other tool can be used to punch a hole in a ball, container or package and take out a small amount of soil or mix. A cool, moist sample that leaves the fingers damp indicates a satisfactory moisture content, while one with no dampness is too dry, and one with free water (as revealed by squeezing) is too wet and needs drainage.

Another method of determining moisture content below the surface is by use of a moisture meter. Fairly reliable meters are available that are easy to use and give an immediate reading. The reading should be taken with the probe in the region of the main part of the root system.

In addition to soil conditions, the condition of certain types of plants such as deciduous plants and herbaceous perennials can be judged when in leaf to determine watering need or adequacy. The criterion in this case is leaf turgidity or its opposite, wilting. Plants should not be allowed to wilt as damage or death is likely to result; therefore, water should be provided when the need becomes apparent, as indicated by slight loss of turgidity rather than after the complete loss of turgidity.

Does the plant have adequate water? Has enough been applied for roots in the bottom of the container or in the center of the root ball? Is there space in the top of the container—an inch or more—to hold water if penetration is slow? Is it applied slowly to round soil balls to allow time for penetration?

It may take hours rather than minutes to adequately water dry soil of some types, because nursery soils vary from high organic to low organic and from sand to heavy clay and they include mixtures of these types. Thus, watering requirements vary, with penetration being

very rapid in the high organic and sandy soil but slow in clay, especially if it is dry when watering is started. Some plants may require watering more than once a day while others may not need watering for several days. Following watering, soil balls should be moist throughout, and enough water should be applied to containers so that the excess flows from the bottom.

Learning watering needs is an area where experience is the best teacher. The person responsible for watering should consider a combination of many factors, including rainfall, humidity, temperature, wind and sunshine, to intelligently judge watering requirements of various plant materials in various types of soil. Each day presents a different set of factors. It is a job for a most responsible person.

### **Avoiding Overwatering**

Plants are living things. Their roots utilize oxygen from soil through the process of respiration. Plants can be injured or killed if roots are too wet too long and needed air is excluded. *Taxus* (yews) are especially sensitive to overwatering, with death often resulting from prolonged periods of excess water in the root zone.

Soluble soil nutrients are lost gradually through leaching when plants are overwatered, and unless replaced by fertilizing, growth may be reduced.

The soil medium around roots of nursery stock needs to be constantly damp but should not be constantly soaking wet.

### **Drainage**

Is drainage adequate? The soil or soil mix in containers should be such that free water drains readily from pore spaces to admit air. Soggy, wet soil does not admit air and does not permit good root growth. Both container plants and balled stock should be displayed on a base that will allow good drainage. Gravel, wood chips, sawdust and bark are all satisfactory as a base for displaying plants. These materials prevent plants from sitting in water, if drainage is provided to the area. Plastic film should not be used as a base unless there is sufficient slope to prevent puddles following watering. Packaged and peat balled stock, if watered, should be drained too. Holes punched in the bottom of the packaged or overwrap are often appropriate for this purpose.

### **Protection From Drying**

Protection from drying is an exceedingly important part of good nursery stock care. It is as important for plants as refrigeration protection is for fresh fruit and vegetables. Failure to provide this protection means damage in only a matter of hours.

Rose packagers go to great lengths to protect from drying by using a generous amount of carefully prepared moistened material for the root pack, and they use plastic or moisture resistant paper for the wrap and special wax for protection of the canes during the sales period.

The use of a heeling medium around burlapped soil balls to prevent fast drying is vital to good care (see



### 3. Heeling Medium.

A heeling medium or mulch such as bark, wood chips, straw or other materials prevents rapid drying and lessens watering requirements. Once B & B stock dries, it may be difficult to thoroughly remoisten. Heeling in is recommended for both short and long periods of storage.

illustration 3). It is also a common practice to heel in bare root stock as temporary holding protection. Sand, weathered sawdust, chips, peat, soil or combinations of these and other such materials are used. The purpose is to prevent rapid drying, thus keeping roots alive and lessening the watering requirements.

Heeling beds may be constructed of wood planks, railroad ties, concrete blocks or any other material suitable to retain the heeling medium to a depth of a foot or more, depending on the size of stock to be accommodated. Beds serve not only to keep the heeling medium from becoming scattered but also for neatness and orderliness to the display grounds (see illustration 4). In addition, beds permit construction of clear walk-



### 4. Heeling Beds.

If possible, display stock in heeling beds which contain mulch, thereby reducing rapid drying and the need for watering. Properly located beds provide ample aisle space and denote neatness.

ways for shoppers and carts, and they provide borders for parking areas.

Unless B & B stock can be heeled in, sprinkler irrigation is necessary to meet frequent watering needs. While both systems have advantages and disadvantages, from the standpoint of good care of stock, heeling in usually is considered best in the long run. However, any kind of a sprinkler which distributes water evenly and at the desired rate will serve the purpose and, if mounted high enough to clear the plants, will provide water distribution satisfactorily.

An opaque plastic bag or wrap around peat balled stock and balled and burlapped stock displayed for sale provides good protection from drying, but it does not bring about a total exemption from watering. Eventually, watering will be needed after transpiration and growth have diminished the supply. Clear plastic should not be used around soil balls because temperatures get very high inside this material when left in direct sunshine.

Container stock gets some protection against drying from the container itself; however, containers made of fiber permit faster drying than those made of plastic or metal. Additional protection is afforded by mulch on top of the soil or mix. This may be shredded bark, bark chips, peat or other material.

In considering the water requirements of packaged stock, the aim is to keep moisture, not free water, in the packing material around the roots. If water is added, it should be done sparingly and drainage provided. Adding water tends to initiate growth of dormant plants in warm temperatures and therefore should be done only when definitely needed.

Wind speeds the drying rate of nursery stock just as it affects laundry on the line or water in the street. Relative humidity, likewise, has an important effect, with very slow drying and slow transpiration occurring at times of high relative humidity readings, and an increase in water loss at times of low relative humidity readings. This may occur at low temperatures as well as high, as is demonstrated when the drying effect of freezing is evident.

## Light

Green plants need light. Until dormant deciduous nursery stock begins growth, it doesn't need light. Trees and shrubs without leaves can be stored in a dark cellar all winter without suffering from lack of light, but the day that buds open and leaf growth begins, light is needed. This could be full sunlight or at least open sky above the stock. Most items of nursery stock can be satisfactorily displayed in full sunlight. However, bare root and packaged dormant trees, shrubs and roses will perform better if shaded and protected from the full drying effects of warm spring sunlight and wind.

Growth produced in the absence of light is elongated, without green color, and is less sturdy than comparable plants with green color. Such growth produced in darkness may, when exposed to sunlight, scorch and die. Therefore, much of the immediate growth potential of the plant is lost due to the depletion of stored carbohydrates. Growth produced in full sunlight is tougher and better able to withstand diverse conditions of weather when the plant reaches its permanent location.

Partial shade is beneficial to evergreens during the sales season because it reduces the drying effect of the sun. Thus, lath houses (see illustration 5) which reduce both light and wind have a protective effect for plants



#### 5. Lath House.

Plants under lath are partially protected from the drying effects of wind and sun. Lath protection is particularly beneficial for broadleaf evergreens and will reduce the watering requirements of other plants.

not needing full sunlight. Shade or partial shade is also beneficial to deciduous stock until growth begins, but after it begins, full sunlight, at least several hours a day, will result in sturdier growth.

### Temperature

A safe temperature range for much displayed nursery stock is from just above freezing to the mid 80's, a defi-

nately narrower range than for the same stock planted in a permanent location. High temperatures affect plants by (1) increasing transpiration (the giving off of water vapor); (2) causing growth processes to speed up; and (3) often drying and shriveling plant tissues. Thus in warm temperatures, water usage is high, and accelerated growth of rapid drying occurs. Both growth and drying are, of course, detrimental to maintaining dormant stock in good condition.

Bare root and root packaged items, roses and any plants with new growth should not be permitted to freeze. Sub-freezing temperatures injure roots that would not be injured at the same air temperature if the roots were planted in soil. For example, American holly roots can be killed at 20°F. above zero, while the tops can withstand cold to about 20°F. below zero. *Magnolia soulangeana* roots can be killed at about 25°F. above zero, and *Taxus* and *Pinus* roots can be killed at 10°F. above zero. When soil freezes in winter, roots of permanently planted stock are not killed because the temperature in the root zone seldom goes below 27-30°F. and may even remain unfrozen if under several inches of snow or mulch.

B & B stock, peat balled stock, and container stock, except when in new growth, can usually withstand sub-freezing temperatures of short duration without injury. This depends, of course, on the prior conditioning of the stock for such exposure. A sudden and severe temperature drop to well below freezing after several days of warm weather may result in damage such as stem bark splitting of some less hardy kinds of stock.

## CARE OF ROSE STOCK

In the retail trade most roses are sold as potted plants in containers or as packaged plants, preferably dormant.

### Potted Roses

To assure that growth will begin, potted roses require some shade, high humidity and protection from freezing. Roots and canes should both show new growth signs before the plants are shipped from the supplier. Roses with new growth indicate viability, and the risk in getting them started is eliminated for the retailer and his customers. Also, a supplier knows that he has shipped a living, growing plant and should anticipate no claims because of failure to grow.

Potted roses should be allowed to grow, the rate of growth being governed largely by temperature. Outdoor light and full sun are more favorable, in fact, almost vital to maintaining quality of this stock. Outdoor temperature and light will keep new growth stocky and sturdier than if growth is produced indoors. A sturdy condition enables plants to better withstand weather encountered when permanently planted.

Protection of potted roses from freezing should be provided. Various methods may be used. For example, in some situations unit heaters are suitable; plants may be moved indoors, or they may be covered adequately with tarps, burlap, straw, etc.

### Packaged Roses

Packaged roses are sold as dormant stock, and dormancy should be maintained as completely as possible throughout the entire sales display period.

Packaged roses with tender new growth are not dormant, and the risk of losing new sprouts through handling or from the effects of frost or hot sun becomes an important disadvantage. The customer is inconvenienced also because a rose with new growth requires careful handling to prevent damage, and very special care is needed to get it established in a new location. Once new growth is lost by accident, pruning or other means, the plant is weakened because it has used much of its stored food supply in producing the new growth. A rose which has produced and lost considerable new growth is usually incapable of producing the amount of growth and blossoms expected by the customer in that season. Furthermore, the plant may be handicapped all season from lack of vigor and remain too weak to survive the following winter.

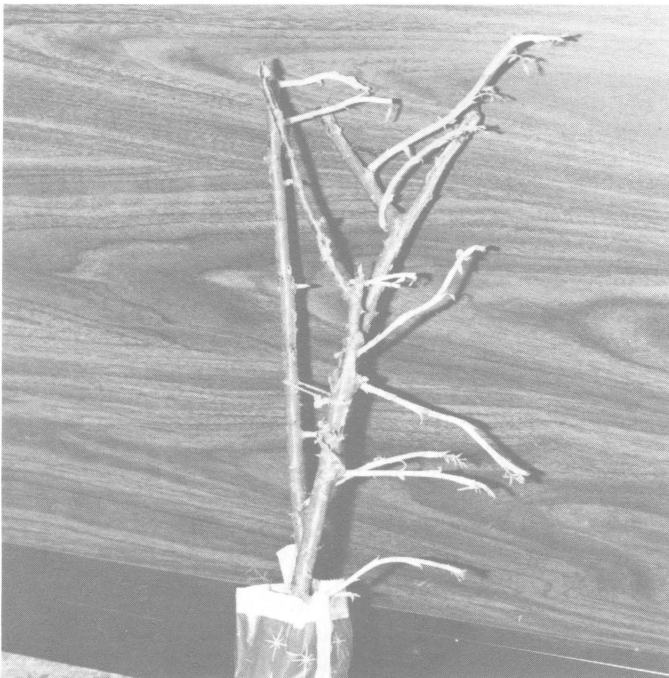
Because packaged roses are usually waxed and packed well to prevent rapid drying, they can be expected to stay in reasonably good condition from one to two weeks, if temperatures are not too high. Seventy-five to 85 degrees, for example, is too high. If kept cool, and humidity is not too low, storage life or display life is extended. Within limits, the lower the temperature, the

longer the storage life; however, roses should not be stored at lower than 33°F.

Procedures followed by some successful dealers in packaged roses include one or more of the following practices: (a) displaying stock outdoors whenever possible. (b) limiting displays (if in a warm place) so that part of the shipment can be kept cool and in good condition for later sales; (c) using refrigeration for part of the shipment not on display, or using refrigerated display cases (vegetable cases) for the sales display; (d) shifting warm display stock to a cool location at night; (e) splitting shipments so that the burden of care and risk of poor weather is not as great at any one time.

#### **Packaged Roses Are Perishable**

The dilemma in which many dealers find themselves when confronted with adverse spring weather and a shipment of packaged roses in a warm store begs for a solution. Many dealers have experienced heavy losses while harboring cases of roses growing extensively in their stock room and waiting for a rainy or cold period to pass. Since roses should not be treated like "hardware", but like bananas or other fresh produce as to display life, what are the best procedures when sales are slow? The best, of course, would be refrigeration at 33—35°F. The second best procedure is to store the roses in outdoor light and temperature, yet protecting from freezing. Shipping cartons should be opened and roses placed in an upright position so that new growth, if any, is in normal upright position, rather than at right angles which subjects it to easy damage (see illustration 6). Dealers who can provide neither of the two alternatives, refrigeration or cool storage, are gamblers with the weather and should expect to lose roses most seasons, and to otherwise be selling lower quality stock.



**6. Excessive Rose Sprouting During Storage or Shipment.** Open shipping cartons containing roses upon receipt and place plants in an upright position in cool storage or on display. Failure to open and expose to adequate light may lead to excessive sprouting and decline in plant vigor.



**7. Pinching New Sprout Growth of Roses.** Removal of three-fourths to one inch of the new sprout growth will reserve stored carbohydrates needed by the roses when planted. Left, prior to pinching, right, after pinching.

#### **Using the "Soft Pinch" Instead of Breaking Off Sprouts**

Unfortunately, some sellers of packaged roses practice removal of new growth because of or to prevent excessive sprouting. This, in some cases, conceals the true condition of the product. It is a violation of Ohio law to offer for sale plants that have been mechanically or otherwise treated to conceal their true condition.

The only type of sprout removal not in conflict with good horticultural practice is a "soft pinch", and this can be condoned only in a limited way. Soft pinching is the removal of the soft tender growing tip of the new sprout, usually about  $\frac{3}{4}$  to 1 inch of the tip. If a soft pinch is made, it should be done when growth is from 1½ to 4 inches in length, and a stub of new growth is left on the cane (see illustration 7). The remaining portion will provide some sales appeal but will not resume growth; instead the food reserves of the plant are saved for other sprouts starting later. The most appropriate use for the soft pinch would be on the earliest sprouts and those at the top of the canes.

The soft pinch is not beneficial, with the exception that it does slow down the loss of vigor by delaying the use of stored food (sugars and starches) needed to produce growth when the rose is planted by the customer. It is a stop-gap measure and should be considered only for emergency use.

If sprout growth is broken off completely at the cane, a large hole is made that will not heal rapidly, causes rapid moisture loss, and provides an entry for fungus diseases. Moreover, this procedure may injure secondary buds, which normally will produce sprout growth in event of failure of the primary bud. Therefore, breaking off sprouts is much less desirable than the soft pinch.

#### **Die-Back Disease of Roses**

Loss of vitality accompanied by fungus infection is responsible for a very high percentage of rose bush losses at the retail level. Any of several different fungi may cause cane infection, in either packaged or potted roses. Basically, control should begin with proper



sanitary measures in grower's fields and continue while plants are in storage. In the case of packaged roses, there is not much a retailer can do to check the disease except to prune away the dieback as it progresses from the top part of the canes. Pruning at least 1½ inches below visible signs of the disease (black or dark brown areas) may check it, especially if followed immediately with an application of fungicide with spreader-sticker to the newly cut canes.

Other than these practices, only cool temperatures will retard the spread of rose cane die-back after it appears on stock being offered at retail. The problem of controlling it is then simply transferred to the customer who, hopefully, will dispose of it with conventional pruning at planting time. However, the best answer to the cane die-back problem is for the producer to make every effort to maintain a high level of vitality and to prevent possible fungus infection from being carried on his plants. Certainly, retailers can be influential in persuading producers to strive for clean vigorous stock.

The vitality of packaged roses declines rather rapidly with time in the retail outlet. It follows that die-back

progresses accordingly, and therefore, the display life of this stock is definitely limited.

While potted roses also suffer from cane die-back disease, they are affected to a lesser extent than packaged stock, due in part perhaps to the general higher quality of plants used for potting. Potted roses usually are into a growing stage rather quickly, thus stopping loss of vigor. To help prevent die-back, a fungicide should be used immediately after the roses are potted and pruned. Canes which are newly cut or scarred are vulnerable to fungus infection and need protection until such openings are well healed. After growth starts, new foliage needs protection from insects and diseases, and, therefore, it is appropriate for retailers to follow a good rose spraying or dusting program for pest control. Mildew, black spot and aphids are the most common plant pests encountered after growth starts; however, the fungi contributing to die-back and cankers on the canes are a constant threat that can be forestalled with proper pruning, the use of appropriate fungicides in the pest control program, and using cultural methods that tend to preserve vitality of the rose bushes.

## CARE OF GENERAL NURSERY STOCK

### Handling Nursery Stock

Care in handling can prevent expensive losses. In loading and unloading, or moving nursery stock displays, plants should be picked up carefully as though perishable, **which they are!** Grasping B & B stock by the top or stem without support to the soil ball itself may cause loss of the soil ball or damage to bark on the stem. Dropping the soil balls hard on the ground will crack them and tear roots, thereby increasing the risk of loss. Plants recently potted are easily pulled from the container and should not be lifted without supporting the container. Trees and shrubs are easily scarred and damaged by careless handling.

Certain woody plants such as prostrate junipers and evergreen euonymus are brittle and will break easily and must be handled with special care. Flower buds are easily broken off, and their loss from plants such as azaleas, rhododendrons, and lilacs can decrease their immediate cash value. The loss of a branch from a plant sometimes means it moves to a lower grade, is worth less money and, of course, has less sales appeal.

Cartons of nursery stock should be opened and inspected soon after arrival and unpacked unless they can be kept in a cool place with temperatures in the 30's or low 40's. The stock itself will need adequate light if growth is started.

Cartons of frozen stock should not be unpacked until they are thawed and plants should not be handled until thawed. Frozen stock should be thawed very slowly.

### Maintaining Labels

An attractive informative label helps sell many types of goods, and nursery stock is an outstanding example (see illustration 8). Customers have the right to expect accurate and complete name labeling of the stock they purchase, especially since it is a legal requirement for nursery stock offered for sale in Ohio (Reference 4).

What is a name? Under the Ohio law, it may be either the botanical name or the common name. The common

name must be approved or recognized by the horticultural industry and horticultural scientists. Also, the name must be complete, i.e., the full name as known botanically or otherwise. As an example, either the botanical name, *Acer rubrum* 'October Glory,' or the common name, October Glory Red Maple, would be acceptable.

The sale of roses, shrubs and trees by blossom color alone is not permitted as it does not constitute labeling with a complete name.

Each retail sales unit (one plant or a package) must be appropriately labeled.



8. Attractive Labels Add Sales Appeal.

Nursery stock offered for sale in Ohio must be labelled with either the complete botanical name or with approved common name. A label with color and description of growth, as well as name, adds to the sales appeal. Grape label above lacks variety name and is therefore unacceptable.

In Ohio, it is the obligation of the producer to adequately label his stock and the obligation of the retailer to maintain the labels. Therefore, it behooves the retailer to let his suppliers know that he expects the stock he purchases to be labeled with accurate and durable labels securely and properly affixed.

### Fertilizing Nursery Stock on Sales Display

If we take a close look at some of the conditions to which plants are subjected such as loss of many roots when dug, often too little or too much moisture and loss of nutrients by frequent leaching, then we realize that supplying the needed mineral elements is important. When and how much depends on several conditions, including the fertility of the soil that came with the plant and whether slow-release fertilizer was provided before shipping. (The supplier should advise on this. Container grown plants and peat balled stock often do have slow-release fertilizer provided in the growing medium.) The soil type is another important consideration. Sandy soils, for example, lose nutrients rapidly by leaching; clay soils, more slowly. The amount of water applied will, of course, have an important bearing on the extent of loss of nutrients by leaching.

All these factors add up to a situation too complex for an easy answer on when and how much to fertilize. Consequently, general procedures are followed by many retailers. They fertilize occasionally, based on their experiences in holding stock in good condition. This may be every two weeks or once a month. In some cases the "constant feed" system is used in which a moderate feeding is provided with each watering. The slow-release fertilized nursery items should not, of course, be included in such programs.

The soluble fertilizers and the slow-release fertilizers are the most popular with retailers of nursery stock because of ease of application and quick availability of nutrients. The slow-release fertilizers also provide safety from plant injury. Several proprietary brands of the various forms are available, and the manufacturer's directions should be followed for each, as fertilizer analyses differ from brand to brand.

Leaf discoloration is the indicator of acute need for nutrients, and with experience one can learn to fertilize prior to the time of leaf discoloration, which may be much sooner with plants grown on a liquid feed program than with the slow-release method. B & B stock and container stock (if slow-release is not present) usually will have greater need for fertilizer than other forms of stock on display.

Whether or not to fertilize displayed nursery stock is determined usually by considering several factors: first, how long the stock may remain on display; second, the producer's fertilizer program in respect to type and frequency; third, the desire to increase growth of certain plants.

In cases where the need justifies the effort, soil tests can be made to determine fertility levels and fertilizer requirements. The county Cooperative Extension Service office can supply kits and instructions for obtaining and mailing soil samples.

### Weeds in Nursery Stock

Weeds are objectionable in nursery stock because: (1) they detract from the appearance of the sales display; (2) they may introduce a serious problem to the cus-

tomers; and (3) they compete with nursery stock for moisture, nutrients, and light.

Any one of these reasons justifies keeping weeds out. Some producers do a good job of providing weed free stock to retailers and others fail miserably, allowing such noxious perennial weeds as bindweed, Canada thistle and quack grass to be spread with their stock.

Dealers with a concern for customer welfare and with an awareness of the costs of keeping their sales areas weed free will, however, look favorably to those suppliers who provide essentially weed free stock.

Modern methods of weed control include both cultural and chemical methods. Information on chemical aspects is provided in the publication, **Chemical Weed Control in Commercial Nursery and Landscape Plantings** (Reference 1). Retailers who have stock carried through the summer should refer to this bulletin for assistance in determining what to use to control weeds in containers and soil balls, as well as in the general sales lot area.

### Overwintering Nursery Stock

Container and B & B nursery stock remaining on the lot at the end of the autumn sales season should be protected against winter injury. There are several methods which can be utilized to protect plants against winter damage.

One of the most effective means of overwintering nursery stock is to place the plants under white plastic covered structures (see illustration 9). To obtain plans for constructing a poly covered quonset structure, contact the County Cooperative Extension office to obtain a copy of Leaflet 270 (see Reference 2). Some dealers overwinter plants in storage buildings or barns, which are satisfactory if sufficient light and facilities to water are available.

If structures are not available, the unsold plants should be "heeled-in", i.e. the soil ball or container should be thoroughly covered with a protective material since the roots are more prone to low temperature injury than branches or foliage. The root system can be covered with soil or completely mulched with wood chips, shredded bark, aged sawdust or any available organic mulching material (see illustration 10).

Evergreen foliage can be protected from damage caused by the drying effect of wind and sunlight with an application of an anti-desiccant such as Vapor Gard,



**9 Plastic Covered Overwintering House.**

Storage of container and balled stock under plastic covered poly houses helps prevent winter damage. Winter storage by retailers and producers helps assure availability of plants in early spring. Overwintering houses may be used to force roses and to display many items for sale in the spring, as shown above.

Wilt Pruf or Foli-gard. These should be applied in December and again in February. In addition to protecting against drying damage, these materials leave a sheen to the foliage which enhances sales appeal.

Further protection from the drying effect of wind and sun can be afforded if the plants are heeled in a lath house or near a natural windbreak.

Since mice and rabbits can cause extensive damage to many types of nursery stock, precautions should be taken to guard against this loss. Fences and repellents can be used against rabbits, and poison bait is effective against mice.

#### 10. Mulching Plants During Winter.

Since the root system is more readily damaged than foliage and branches during winter, a mulch covering the soil by several inches is desirable. Bark is used (right) to mulch trees and other plants.



## CARE OF PERENNIAL FLOWER PLANTS

Perennials (non-woody herbaceous hardy plants) are classed as nursery stock under Ohio law and as such are subject to state inspection. Retailers are faced with the responsibility of caring for perennials to assure viability when sold just as they are for other types of nursery stock in their stores. Losses of this class of stock are often extremely heavy. The chief causes are: (1) long display time, because of inclement weather, (2) inadequate light and high temperatures, which force growth while plants are on display, and (3) fungus problems, which tend to proliferate after plants leave storage.

Perennial nursery stock appears on the market in packages or containers. Packaged stock is usually from winter storage and may or may not have roots packed in a growth sustaining medium. Container stock may have been dug recently from the field or beds, usually with a clump of soil, and potted into containers, or it may have become established by growing for several weeks in containers. With a little care, perennials in containers

from either method of production can be planted by the customer without disturbing the roots. Loss of container perennial stock by retailers or customers is usually substantially less than with packaged stock.

Successful holding of perennials while on sales display is dependent on outdoor temperatures and light. A high percentage of perennial losses occurs because of excessive growth in warm sales areas with low light level. Such "forced" growth weakens the plants, reduces future growth potential, and renders plants susceptible to damage from weather extremes when planted outdoors. Perennials displayed outdoors (unless in forced growth) will usually withstand light freezes as well as full sun without injury and will be in better condition for planting by the customer.

Perennial plants should be closely examined periodically and dead or diseased stock removed from the sales display area. A general fungicide such as Captan can be applied if deemed necessary to prevent disease spread.

## CARE OF HARDY BULB STOCK

Hardy bulbs such as lilies and fall planted bulbs (daffodils, hyacinths, tulips, etc.) are classed as nursery stock in Ohio. The non-hardy kinds, sold for spring planting such as cannas, begonias, dahlias and gladiolus (actually rhizomes, tubers and corms but termed "bulbs" by most retailers), are not nursery stock in Ohio in the legal sense because they are not winter hardy.

Fall bulbs require little in the way of special care. They may get too dry if left in a warm room too long. However, they usually withstand the main part of the sales season in good condition, and it is only the leftover bulbs that may be in questionable condition by late fall or early winter. Occasionally diseased bulbs are found, in spite of careful sorting and grading by the shippers; therefore, frequent checking for evidence of

disease is good practice.

Because "fall bulbs" must be exposed to a cool period for root growth and conditioning before the flowering season, such bulbs do not flower satisfactorily if planted in the spring. Consequently, their sale as dry bulbs for outdoor planting is prohibited in Ohio after February.

Lilies are the most troublesome of bulbs sold in the spring as they tend to produce new growth easily, especially if the packaging holds the humidity high. Opening packages and keeping stock at cool temperatures will help retard new growth. Pottling the stock to sell after it becomes established in a container is a method of salvage when new growth becomes excessive. Lilies may be sold and planted in the fall, and at that season they are not apt to produce growth while on sale.

# HAZARDS IN RETAILING NURSERY STOCK

Dealing in live plant material involves certain risks. Normally, the biggest of these is weather unfavorable for promoting sales.

There is also some risk in failure to receive stock of anticipated quality or viability and at the specified time. These are matters essentially between retailer and supplier, or between retailer and shipping agency in some cases. But matters of viability (including mechanical damage), name labeling, certification, presence of plant pests and adequate protection to maintain vigor are also of concern to inspectors of the Ohio Department of Agriculture. The retailer should feel free to use their services and immediately call his inspector if stock is received with any of these subjects in question. The inspector will provide an impartial appraisal of the conditions and a report for record as of the day of inspection. The Ohio Plant Pest Law is one of the earlier consumer protection laws, as it dates back to 1902, and the nursery stock viability features of it date back to 1941. Its advantages apply to both wholesale and retail customers.

## Freeze Damage

Freeze damage can occur to many kinds of plants. Roses frequently suffer freeze damage, because having been produced in a mild climate or held over winter in storage, they may not have had the "hardening" process of exposure to gradually declining temperatures. Therefore, when received by the store, roses are usually somewhat "tender" and need protection from freezing. When new growth begins, it is particularly susceptible to injury from freezing. Both old and new cane growth can, therefore, be damaged.

Fruit trees and shrubs, which have been held in storage may also lack sufficient hardening for resistance to severe freezing. However, light freezes usually do not injure these plants.

Evergreens that have just produced new growth are susceptible to spring freeze injury, because the new growth is tender and not sufficiently hardened. Evergreens with such injury become brown and unsightly, difficult to sell and lose much of their growth potential for that year.

The damaging effect of freezing temperatures can often be prevented by adequately covering stock, or by the **constant and liberal** use of sprinkler irrigation during the freezing period and until the ice is melted.

Plants should not be handled while frozen, with or without ice covering them, as frozen tissues break, resulting in death and eventual browning of broken twigs and branches.

Hail, of course, is a hazard to all plant material and is most damaging to leafy stock. However, even the branches and stems may be badly cut and permanently scarred by severe hail storms.

Unless protected, container stock is susceptible to injury from severe freezes. Certain kinds may be killed during winter if temperatures are well below freezing for extended periods, or if the plants are not adequately watered. The injury may not be detectable until shortly before the time growth would start in the spring. Injury will show on evergreens first as faintly abnormal color and later with more pronounced color and dry foliage. The cause can be attributed to either winter drying of

foliage or to low temperature injury to the roots or foliage.

## Heat Wave

Temperatures in Ohio have been known to reach 90°F. as early as April 1. Heat waves, while not common, happen now and then in the spring. Heat absorption by pavement, buildings and other non-reflective surfaces may cause temperatures of these objects to increase by 20-30°F. or more above air temperature. Water will cool such surfaces drastically, and shade helps prevent a heat build up. Nursery stock, especially dormant material, needs all the protection it can get during such periods, and using water on the entire plant will keep it cooler and reduce drying of the tissues.

## Drying Damage to Evergreens

In addition to winter drying, evergreen nursery stock may suffer from lack of moisture at other times. Soils and weather in different nursery growing areas vary considerably, and if stock is from a dry area, immediate watering is needed. Failure in this is potential death for the stock. Evergreens may look perfectly good and fresh, yet actually be suffering from lack of moisture. Having lost roots when dug, and provided only with the limited and temporary moisture of the soil ball, their chances for survival depend on proper watering and protection against drying.

Injury due to failure to water adequately and in time may not be detectable for many days after the damage is done. The point of no return with evergreens may be reached much earlier than one would suspect from the appearance of the foliage.



11. Girdling Effect of Plastic Twine.

Wire or plastic twine used to affix labels or secure burlap can lead to girdling and subsequent death, if not removed. Advise customers to remove all wire and plastic twine at the time of planting.

## Plastic Twine and Wire

Sometimes nurserymen use plastic twine or wire to secure burlap and plastic around soil balls of nursery stock. If these materials are tied around the stem of the plant, they should be removed (from this position) at planting time; otherwise the stem will eventually be girdled, causing loss of the plant (see illustration 11). Customers who buy plants secured in this manner should be cautioned to remove the stem-encircling material. Posting signs or tagging plants with this advice is probably better than depending strictly on verbal reminders.

## Plastic Burlap Substitute

The full effects of surrounding root balls with plastic burlap and plastic netting are not known at this time. However, it is known that most such products do not deteriorate underground. Roots penetrate the material, but as the roots enlarge, they may be girdled and killed from the girdled point out to the growing tip. Good planting practice, therefore, dictates that the plastic be at least partially cut away and removed or severely slashed after the plant is set in the hole. Advice to this effect passed on to customers is certainly justified.

## Other Hazards

Die-back disease is a very real hazard causing heavy losses of packaged roses in some seasons and some loss in all seasons, has been discussed under "Care of Roses" above.

Short roots of nursery stock, inadequate to support the needs of a plant, have been the cause of significant losses of all forms of stock except that which is container grown. Short roots result either from improper digging or from heavy pruning of roots before potting, packaging or peat balling. Loss or partial loss of roots may result from drying, storage mold or breakage.

Nursery stock, particularly packaged stock that has become too dry before shipment to the retailer, usually will be shriveled. Such a condition results in a weakened or dead plant. Short roots are sometimes responsible for dry, shriveled plants, but inadequate protection of the roots somewhere in handling between field and market also may cause losses from drying.

Producing good root systems and maintaining them in good condition are essential features of a grower's viability control program. The retailer would be well advised to emphasize good root systems in his buying relationship with the supplier.

# CHECK LIST OF SUPPLIER'S RESPONSIBILITIES

The following list may be used by retailers and wholesalers to check out a given lot of stock or product line for a measure of quality and viability standards:

1. Is the stock in healthy, viable condition? Is it well protected for shipment?
2. Do the plants have good root systems (see illustration 12)?
3. Are soil balls at least up to acceptable size, or to size specified?
4. Have "dormant" plants been kept dormant before shipping?
5. Has the supplier advised of any special care of the stock in respect to watering, shading, fertilizing or freeze protection?
6. Are plants up to the grade specified? (See reference 5 for grade standards: **USA Standard for Nursery Stock**)
7. Are correct and durable labels provided? Are they securely and properly affixed?
8. Are appropriate inspection certificates provided?
9. Are important selling features made known to the retailer?
10. What are the limits of liability to the wholesaler for losses?



**12. Inadequate Root System.**

Plant roots can be damaged in harvest, storage, shipping or handling and, if so, may be inadequate to support the above ground portion. Discard plants with inadequate roots as survival prospects are poor.

# CHECK LIST OF RETAILER'S RESPONSIBILITIES

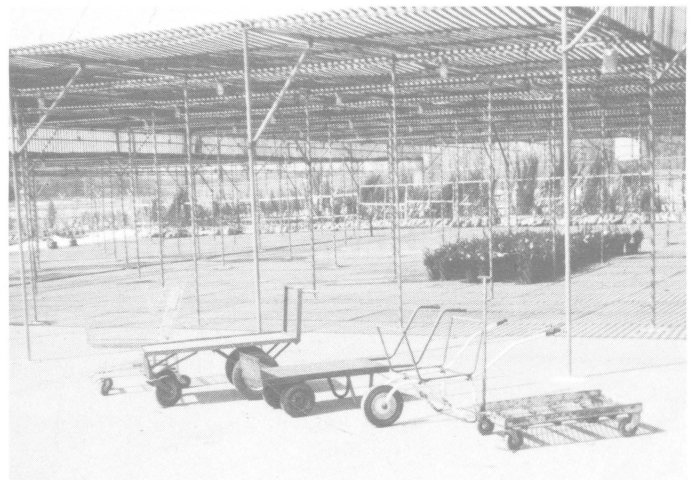


**13. Poorly Displayed Nursery Stock can Be Hazardous.**

Nursery stock should be displayed in such a manner that the danger of accidents is minimized to the fullest extent. Avoid narrow aisles. Plant branches extending into the aisle may cause customers to trip, injure an eye or damage clothing.

1. Are personnel handling stock carefully?
2. Is protection from drying programmed; material available; personnel instructed?
3. (a) Are immediate watering needs checked and provided for?  
(b) Is equipment available for long-term watering?  
(c) Have personnel learned to judge watering needs?
4. Is light adequate for all types of stock?
5. (a) Are personnel aware of which items are susceptible to freeze injury?  
(b) Is protection from freezing available for susceptible items?

6. (a) Is all stock properly labeled?  
(b) Are display signs accurate and readily visible?
7. (a) Have personnel been alerted to watch for unfit-for-sale items; are they attempting to learn to spot them?  
(b) Are unfit items withdrawn promptly from sales display?
8. (a) Is stock displayed in such a manner as to minimize the accident hazards to both children and adults? Branches can injure eyes, cause tripping or catch on ladies hose (See illustration 13).  
(b) Is the display neat and well organized, and does it have easy and inviting access?
9. Are sales personnel involved in a "learning endeavor" covering aspects of plant care and culture so that they may be of greater service to their employer and the customers?
10. (a) Are suitable carts available for customers to transport plants and supplies to the register and automobiles (See illustration 14)?  
(b) Is suitable equipment available for pruning and spraying, if needed?



**14. Types of Carts.**

Transporting heavy, bulky plants as well as supplies is aided with carts. Provide an ample number for customer use during the peak sales season in April and May.

## SUMMARY

Basic information relating to proper care of nursery stock offered for sale in Ohio is discussed. The methods used in handling and caring for plants directly relate to losses, and most losses can be prevented if adequate care is used.

Only sound, healthy nursery stock stored or displayed under conditions which will maintain its vigor may be offered for sale in Ohio.

The different forms of stock (balled, container, packaged, bare root) have various care requirements specifically influenced by environmental conditions as affected by moisture, light and temperature.

Moisture is necessary to keep plants alive and must be supplied in adequate amounts when needed. Over-watering is also a problem that results in loss of roots or

death of plants. Examination of nursery stock soil to determine if moisture is adequate or in excess is important. The person in charge of watering must understand how the various weather factors, kinds of soil or soil mix, methods of packaging and kinds of plants influence the need for water. A most responsible person is needed for this task, one who is capable of studying all aspects of the problem, including drainage, methods of preventing drying and how to watch for signs of water need.

Adequate light, in most cases outdoor light, is needed for nursery stock in growth. Inadequate light causes abnormal development not sufficiently sturdy for some conditions encountered when stock is planted in permanent locations.

The safe temperature range for nursery stock on display is more limited than for plants of the same kind in the ground. Partial shade is beneficial at certain times for certain kinds of plants displayed for sale.

Careful handling of nursery stock is essential to maintaining viability and quality of stock.

Bulbs, corms and rhizomes and other perennials that are hardy outdoors in winter in Ohio are classed as nursery stock. "Fall bulbs" require a cool period after planting to bloom properly and, therefore, may not be sold for outdoor planting after February.

Losses of packaged perennials displayed for sale are high. Outdoor light and temperature rather than indoor conditions help reduce such losses considerably. Perennials growing in containers have a much better record of survival than packaged stock.

Roses are usually sold as potted growing plants, or they are sold as packaged plants which should be dormant. Outdoor light and temperature are usually the best environment for rose sales displays unless refrigeration is available as an aid in maintaining dormancy for packaged stock.

Packaged roses are perishable, have a short "shelf life" and should be merchandized like fresh produce rather than like hardware.

Removal of new sprout growth from packaged roses is generally not advisable, except in certain instances where the "soft pinch" is applicable to early sprouts at the top of the canes.

Die-back disease of rose canes causes high losses of packaged roses and is often more prevalent on lower grades and lower quality stock. It is related to the innate vitality of the plants, but pruning out infected areas and application of a fungicide can be practiced by the retailer to help check the spread of the disease.

Control by the producer is the real key to preventing problems for the retailer and his customers.

Accurate and complete name labeling is a legal requirement for nursery stock sold in Ohio; the name may be either an accepted common name or the botanical (scientific) name.

Fertilizing nursery stock that is displayed for extended periods (several weeks) is common practice. The most popular forms of fertilizer for this purpose are those for liquid feeding and those designated as "slow-release".

Weeds in nursery stock are displeasing in appearance, may cause a problem for customers and compete with nursery plants for moisture and nutrients.

Balled and container stock can be overwintered outdoors by heeling in, preferably behind a windbreak. Unheated buildings are sometimes used for all forms of stock, and storage in plastic greenhouses is a popular and successful method of overwintering stock.

Hazards in the business of selling nursery stock are dominated by those relating to the perishable nature of the material. It can be mechanically damaged in handling, and it can also be damaged by freezing or high temperatures, lack of light, inadequate moisture or poor drainage. The use of plastic twine around the stem of plants can girdle and kill them if not removed; plastic burlap substitute may interfere with normal root growth, unless at least partially removed at planting time.

A check list of "Supplier's Responsibilities" which can be used by either the supplier or the retailer is provided; also, a list is included for the retailer to check against his own facilities and organization.

Other sources of information are listed under "References".

## SOURCES OF INFORMATION

There is little previously published information available on the specific subject of care of nursery stock in retail outlets, but the references cited will provide some help. Particularly for buyers, the **USA Standard for Nursery Stock** (Reference 5) will be helpful in introducing standards and grades for all types and forms of nursery stock which they may be ordering. It is well illustrated and provides details of specifications of standards for the many kinds of stock.

For general horticultural information beneficial to those engaged in the sale of nursery stock, there are innumerable books available in libraries; a single volume found by many to be most helpful is **Wyman's Gardening Encyclopedia** (Reference 6).

For information concerning problems encountered

by customers with the culture of ornamental plants, a series of 1-sheet leaflets entitled, "Landscape Facts" is available on a great variety of subjects. This material, prepared by members of The Ohio State University Cooperative Extension Service, is available free in quantity and may be made available by retailers to their customers. A list of the subjects for which leaflets are available and an order form can be obtained on request (Reference 3).

Specific questions relating to the care of nursery stock not answered in this bulletin may be submitted to the Cooperative Extension Agent (Agriculture) located in the county seat, or the Plant Pest Control Section, Division of Plant Industry, Ohio Department of Agriculture, Reynoldsburg, Ohio 43068.

## REFERENCES

1. **Chemical Weed Control in Commercial Nursery and Landscape Plantings**—MM 297, Extension Office of Information, Agriculture Administration Building, 2120 Fyffe Rd., Columbus, Ohio 43210. (Free)
2. **Constructing a Poly Covered Storage House** — L-270, Extension Office of Information, Agricultural Administration Building, 2120 Fyffe Rd., Columbus, Ohio 43210 (Free)
3. **Landscape Facts**—(Order Form), Extension Office of Information, Agriculture Administration Building, 2120 Fyffe Rd., Columbus, Ohio 43210. (Free)
4. **Ohio Plant Pest Law** — Chapter 927, Ohio Revised Code, sections 927.51-927.99. Available from Plant Pest Control Section, Division of Plant Industry, Ohio Department of Agriculture Laboratories, Reynoldsburg, Ohio 43068. (Free)
5. **USA Standard for Nursery Stock** — (1973), (30 page bulletin), Sponsored by American Association of Nurserymen, Inc., 835 Southern Building, Washington, D.C. 20005
6. **Wyman's Gardening Encyclopedia** — (1971), (1222 page book), The McMillan Co., 866 Third Ave. New York, N.Y. 10022

## GLOSSARY

- B & B** — Balled and burlapped, refers to nursery stock dug with a soil ball and secured with burlap.
- B R** — Bare root, refers to nursery stock dug and moved with no soil around the roots.
- Bulb** — Underground bud with a short thick stem producing roots from below and bearing overlapping, scale-like leaves; e.g., lily, tulip.
- Corm** — A bulb-like underground portion of plant stem consisting of fleshy tissues, but not in layers as with true bulbs; e.g., gladiolus, crocus.
- Cultivar** — A horticultural or cultivated variety that has originated and persisted under cultivation. Distinguished typographically by single quotation marks.
- Deciduous** — Refers to plants that are leafless during all or part of the dormant season.
- Field potted** — Refers to plants dug from the field with soil intact around roots and immediately potted.
- Force** — To cause growth or bloom development earlier than normal.
- Growing Medium** — Soil of any type or any soil substitute, including organic matter such as compost and peat moss or nonorganic such as sand, perlite and vermiculite or any combination of these.
- Hardening-off** — To expose gradually to more extreme conditions such as lower temperatures.
- Hardy** — Refers to plant capability of withstanding winter conditions in a particular area. The U.S. is divided into 9 zones with Ohio in zones 4, 5 and 6. The lower the number the hardier a plant must be to survive (See reference 6).
- Heeling-in** — Storing plants by covering roots with soil or other media while awaiting permanent planting.
- Herbaceous** — Plants with fleshy stems, not developing woody persistent tissues.
- Nursery stock** — (legally in Ohio) — Any hardy plant, wild or cultivated, and any cutting, graft, scion, or bud thereof.
- Organic Matter** — Usually applied to decomposing plant or animal refuse in the soil.
- P B** — Peat balled, refers to nursery stock which has had a water retaining medium, composed of peat, bark or other organic material applied to the plant root system and secured in burlap or other fabric.
- Perennials** — In nursery industry usage, refers to herbaceous plants that continue to live from year to year such as iris, delphinium, peonies, phlox, etc.
- Rhizome** — A thick rootstem located under or along the ground producing roots from the lower side and leafy shoots from the upper surface; e.g., iris.
- Relative Humidity** — A figure indicating the amount of water vapor in the air as a percentage of the total amount at saturation at a given temperature.
- Respiration** — The utilization of oxygen and carbohydrates and the giving off of carbon dioxide by plant tissues. This process provides energy for plant growth.
- Slow Release Fertilizer** — A fertilizer which is available to the plant over a long period of time in comparison to inorganic fertilizers such as those for farm use, which are immediately available to the plants.
- Soil Aggregates** — Soil constituents combined together in particles with air spaces between
- Soft Pinch** — Removal of the terminal or succulent growing tip of plants in order to limit size or to induce lateral branching.
- Transpiration** — The giving off of water vapor from the aerial parts of a plant chiefly through leaf tissues.
- Tuber** — A short, fleshy underground stem with buds or "eyes" and tiny scale leaves; e.g., potato, dahlia.
- Turgid** — A condition of plant tissues, especially leaves, having adequate moisture and not wilted.
- Viable, Viability** — Capable of living and developing normally.