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DESICCATION CONTROL OF BARE ROOT STOCK[1]

It should not be surprising that moisture loss during handling and storage of bare-root nursery stock contributes directly to poor re-establishment. In fact, several studies have identified desiccation as a major factor in loss in plant quality during the period when the plants are out of the ground. The potential for problems cannot be over-emphasized.

For a number of plant materials, including herbaceous perennials, conifer seedlings, and shrubs, we have measured the rate of moisture loss to be in the range of 1-2% per hour when exposed to temperatures of 72°F and 50% RH.

We have also found that an overall loss of more than 20% moisture can lead to a serious decline in regrowth quality. Thus, even 10-20 hours of exposure to these conditions can cause serious problems if the rate of water loss is not controlled by some means or another.

In several cases, the plants may be held in storage for weeks or even months depending on the situation and needs of the nurserymen. Although the long term storage should be at temperatures near 32°F within controlled, refrigerated conditions, the potential for desiccation still exists. Due to the nature of their operation, refrigerators constantly remove moisture from the storage environment.

The situation arises because the coils (the part of the refrigerator over which air is passed for cooling) must be held at a temperature lower than that desired within the storage facility. A common rule of thumb is for the coils to operate 10º F cooler than the storage environment. The problem arises from the physical fact that cooler air cannot hold as much moisture as warmer air.

This means that as air passes over the coils and cools, the excess moisture will condense directly onto the coils. If the coils are operating at 20-30°F, this moisture will immediately freeze. The ice can only be removed by periodic defrost cycles during which the coils are heated to above freezing. Unfortunately, storage temperatures will rise during this period.

Nurserymen should be aware of the consequences of misting plants in refrigerated storage.

A common practice during storage of bare-root woody stock is to add free water to the plants by misting. However, it should be realized that the moisture added to the storage environment will put an extra burden on the refrigeration system since there will be a need for even more defrost cycles. This causes additional problems since temperature fluctuations within the storage facility can be harmful to the plants.

Thus, although misting is relatively common in woody plant storage, nurserymen should be aware of the consequences. I would strongly recommend that a device be used to constantly monitor temperature. If fluctuations in the range of 5°F are occurring on a regular basis, consider reducing the amount of free water added to improving the efficiency of the refrigeration.

Water loss can also be controlled by the use of plastic films. This is particularly suitable for smaller material such as bare-root herbaceous perennials, seedling conifers and rooted cuttings. Essentially all the results of our research in the general area of packaging demonstrate the effectiveness of films. In several studies, water loss was minimal even after 6 to 8 months in storage. There are a few points which should be stressed, however. The first is that all films are not created equal. For best results, we recommend 4 mil polyethylene film. This should not be sealed or there will be problems with oxygen and carbon dioxide. Simply fold the ends over to permit some exchange of these gases. Plastic films also retard heat movement. Thus, if warm plant material is packaged, it will take longer to cool if packed in plastic than if left open.

A common complaint is that condensation occurs on the inside surface of the plastic. However, it should be stressed that this will usually happen only when the temperature in the storage facility is fluctuating. For instance, if moisture is being added to one group of exposed plants, this will create problems for packaged plants. When all the plants are properly packaged in plastic, the amount of free moisture in the storage facility is greatly reduced and temperature fluctuations are much less of a problem.

Condensation usually occurs only when storage temperature is fluctuating.

Plastic films are also of great benefit when plant material is removed from storage. In fact, when receiving non-packaged bare-root stock, cover them as soon as possible. In our studies, bare-root stock can be safely held for a few days at room temperature prior to planting, but only if they are completely protected from desiccation.

One other means of preventing desiccation is the use of wax, most commonly used on rose canes during marketing. All research, including a recently concluded study in our laboratory, demonstrates that wax improves the subsequent performance of the plants. Waxed roses invariably break earlier, have more breaks, and produce more canes and flowers during the first 2 years of growth than do non-waxed roses in research studies.

Wax not only prevents desiccation during retail display, but also during the subsequent re-establishment period in the garden. Most likely due to its unsightly appearance, wax seems to be associated with poor quality plant material by many nurserymen and consumers. This may also be a result of how these roses are marketed since they are often exposed to relatively warm, dry

conditions. It should be noted, however, that under such conditions, non-waxed roses decline in quality even faster than waxed roses.

We have conducted limited studies on the use of polymer antitranspirant application to rose canes since most of these products do not detract from the appearance. Unfortunately, in our research thus far, we have found that they also do not adequately prevent water loss from the canes and currently are not recommended for this use.

The most susceptible periods for damaging moisture loss from plants are at harvest and just prior to planting.

Overall, prevention of desiccation is imperative during all phases when nursery stock does not have its roots in the soil. By far, the most susceptible periods are at harvest and just prior to planting while the plants are unprotected and exposed to elevated temperatures. The use of plastic films is highly recommended as long as temperature fluctuations do not cause condensation. Attention to these details will certainly lead to improved re-establishment in the field. §

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