ENH1

UF UNIVERSITY of FLORIDA
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Cold Protection of Ornamental Plants[1]

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Winter temperatures in Florida are frequently low enough to cause cold injury to tropical, subtropical, and occasionally temperate plants not adapted to Florida climatic conditions. Tropical plants and summer annuals do not adapt or harden to withstand temperatures below freezing and many are injured by temperatures below 50°F (10°C). Subtropical plants can harden or acclimate (become accustomed to a new climate) to withstand freezing temperatures and properly conditioned temperate plants can withstand temperatures substantially below freezing. Freezing conditions occur annually in north and central Florida, while below freezing temperatures are rare for south Florida. Freeze probabilities for various locations in Florida are published in IFAS Bulletin 777, *Freeze Probabilities in Florida*.

Freezes can be characterized as radiational or advective. **Radiational freezes** or frosts occur on calm, clear nights when heat radiates from the surfaces of objects into the environment. These surfaces can become colder than the air above them due to this rapid loss of heat or long wave radiation. When the air is moist, a radiant freeze results in deposits of ice or frost on surfaces. Dry radiational freezes leave no ice deposits but can cause freeze damage. Plant damage from a radiational freeze can be minimized by reducing radiant heat loss from plant and soil surfaces.

Advective freezes occur when cold air masses move from northern regions causing a sudden drop in temperature. Windy conditions are normal during advective freezes. Although radiant heat loss occurs during an advective freeze, the conditions are quite different from a radiational freeze. Plant protection during advective freezes is more difficult.

The ability of plants to withstand freezing temperatures is affected by temperature fluctuations and day lengths prior to a freeze. A gradual decrease in temperature over a period of time increases the ability of plants or plant parts to withstand cold temperatures. A sudden decrease in temperature in late fall or early winter usually results in more damage than the same low temperature in January of February. Short durations of warmer temperatures in midwinter can deacclimate some plants resulting in bud break or flowering. Deacclimated plants are more prone to freeze injury. Preconditioning of tropical plants to withstand chilling temperatures has not been well documented.

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Cold injury can occur to the entire plant or to plant parts such as fruits, flowers, buds, leaves, trunks, stems or roots. Many plant parts can adapt to tolerate cold, but fruits and roots have little ability to acclimate or develop cold tolerance. Cold injury to roots of plants in exposed containers is a common occurrence and usually is not evident until the plant is stressed by higher temperatures. Leaf and stem tissue will not survive ice formation inside the cells (result of rapid freeze) but many plants can adapt to tolerate ice formation between cells.

One type of winter injury is plant desiccation or drying out. This is characterized by marginal or leaf tip burn in mild cases and totally brown leaves in severe cases. Desiccation occurs when dry winds and solar radiation result in the loss of more water from the leaves than can be absorbed and/or transported by a cold or frozen root system. Root systems in the landscape are seldom frozen in Florida, but potting media in small containers in north Florida can be frozen for several consecutive hours.

WHAT TO DO BEFORE THE FREEZE

Homeowners can take steps to help acclimate plants to cold temperatures and to protect plants from temperature extremes. These steps range from selection of a proper planting site to alteration of cultural practices.

Planting Site Selection

The microclimate of a location is determined by factors such as elevation, landform, surface reflectivity, soil properties, degree of canopy cover, proximity of structures or plants, and the general solar heat exchange model. Temperature fluctuation can differ from one location to another, even within a residential landscape. Thus, existing microclimates and/or possible modifications of microclimates should be considered when choosing the planting site for cold sensitive plants.

Tender plants should be planted in a site with good air drainage, and not in a low area where cold air settles. Arranging plantings, fences, or other barriers to protect tender plants from cold winds improves cold protection, especially from advective freezes. Poorly drained soils result in weak, shallow roots which are susceptible to cold injury.

Proper Plant Nutrition

Plants grown with optimal levels and balance of nutrients will tolerate cold temperatures better and recover from injury faster than plants grown with suboptimal or imbalanced nutrition. Late fall fertilization of nutrient deficient plants or fertilization before unseasonably warm periods can result in a late flush of growth which is more susceptible to cold injury. Plants in Florida landscapes should be fertilized four times per year. Landscape plants in north and north central Florida should be fertilized in March, June, September, and December. Plants in south and south central Florida should be fertilized in February, May, August, and November. One to 1 1/2 pounds (454 to 681 grams) of 6-6-6 or 8-8-8, or 1/2 pound (227 grams) of 12-4-8 or 16-4-8 should be applied per 100 square feet (9 square meters) of planting area for the first three applications per year. A decrease in the amount of fertilizer applied in the fall is necessary because plant nutrient consumption declines during the colder season. Plants grown in colder portions of the state require one-third to one-half the standard fertilization rate in the fall, and two-thirds the standard rate should be applied in the warmer sections of Florida.

Shading

Tree canopy covers can reduce cold injury caused by radiational freezes. Plants in shaded locations usually go dormant earlier in the fall and remain dormant later in the spring. Tree canopies elevate minimum night temperature under them by reducing radiant heat loss from the ground to the atmosphere. Shading from early morning sun may decrease bark splitting of some woody plants. Plants that thrive in light shade usually display less winter desiccation than plants in full sun. But plants requiring sunlight that are grown in shade will be unhealthy, sparsely foliated, and less tolerant of cold temperatures.

Windbreaks

Fences, buildings, and temporary coverings, as well as adjacent plantings, can protect plants from

cold winds. Windbreaks are especially helpful in reducing the effects of short-lived advective freezes and their accompanying winds. Injury due to radiational freezes is influenced little by windbreaks. The height, density, and location of a windbreak will affect the degree of wind speed reduction at a given site.

Water Relations

Watering landscape plants before a freeze can help protect plants. A well watered soil will absorb more solar radiation than dry soil and will reradiate heat during the night. This practice elevated minimum night temperatures in the canopy of citrus trees by as much as 2°F (1°C). However, prolonged saturated soil conditions damage the root systems of most plants.

Other Cultural Practices

Avoid late summer or early fall pruning which can alter the plant hormonal balance resulting in lateral vegetative budbreak and a flush of growth. This new growth is more susceptible to cold injury.

Healthy plants are more resistant to cold than plants weakened by disease, insect damage, or nematode damage. Routine inspection for pests and implementation of necessary control measures are essential. Contact your County Extension Office for information on pest identification and recommended controls.

Methods of Protection

Plants in containers can be moved into protective structures where heat can be supplied and/or trapped. Containers that must be left outdoors should be protected by mulches and pushed together before a freeze to reduce heat loss from container sidewalls. Leaves of large canopy plants may be damaged if crowded together for extended periods.

Heat radiating from soil surfaces warms the air above the soil or is carried away by air currents. Radiant heat from the soil protects low growing plants on calm cold nights, while tall, open plants receive little benefit. Radiant heat loss is reduced by mulches placed around plants to protect the roots. For perennials, the root system is all that needs to be protected since the plants die back to the ground annually.

Coverings protect more from frost than from extreme cold. Covers that extend to the ground and are not in contact with plant foliage can lessen cold injury by reducing radiant heat loss from the plant and the ground. Foliage in contact with the cover is often injured because of heat transfer from the foliage to the colder cover. Some examples of coverings are: cloth sheets, quilts or black plastic. It is necessary to remove plastic covers during a sunny day or provide ventilation of trapped solar radiation. A light bulb under a cover is a simple method of providing heat to ornamental plants in the landscape.

WHAT TO DO DURING A FREEZE

Ornamental plants can be protected during a freeze by sprinkling the plants with water. Sprinkling for cold protection helps keep leaf surface temperatures near 32°F (0°C) because sprinkling utilizes latent heat released when water changes from a liquid to a solid state. Sprinkling must begin as freezing temperatures are reached and continue until thawing is completed. Water must be evenly distributed and supplied in ample quantity to maintain a film of liquid water on the foliage surfaces. Irrigation for several days may water soak the soil resulting in damaged root systems and/or plant breakage due to ice build up. Consult Extension Circular 348, *Sprinkler Irrigation for Cold Protection*, for more technical information on this subject.

WHAT TO DO AFTER THE FREEZE

Water Needs

Plant water needs should be checked after a freeze. The foliage could be transpiring (losing water vapor) on a sunny day after a freeze while water in the soil or container medium is frozen. Apply water to thaw the soil and provide available water for the plant. Soils or media with high soluble salts should not be allowed to dry because salts would be concentrated into a small volume of water and can burn plant roots.

Pruning

Severe pruning should be delayed until new growth appears to ensure that live wood is not removed. Dead, unsightly leaves may be removed as soon as they turn brown after a freeze if a high level of maintenance is desired. Cold injury may appear as a lack of spring bud break on a portion or all of the plant, or as an overall weak appearance. Branch tips may be damaged while older wood is free of injury. Cold injured wood can be identified by examining the cambium layer (food conducting tissue) under the bark for black or brown coloration. Prune these branches behind the point of discoloration.

Florida homeowners enjoy a vast array of plant materials and often desire a tropical or semitropical appearance to their landscapes. Plants are often planted past their northern limit in Florida, although microclimates differ dramatically. Tropical and subtropical plants can be used effectively in the landscape, but they must be protected or replaced when necessary. A combination of tender and hardy plants should be planted in order to prevent total devastation of the landscape by extremely cold weather.