

KINGMAN IS GROWING! COLUMN

Identification and Prevention of Frost or Freeze Damage

By *Linda Reddick*, Kingman Area Master Gardener

Again this year we have been experiencing some very cold weather, with frost or freeze damage, for many areas, almost every night. The difference between frost damage and freeze damage is; Frost damage in plants results from the liquid inside individual cells freezing and forming ice crystals. The crystals then rupture the tough cell walls. When the cell walls open the fluid inside will not be contained so when the ice melts the fluids simply drain out. Freeze damage occurs when temperatures sustain at 32 degrees or below and is progressive within plants. But, freeze damage to tender plants may occur much sooner. The softest tissues like leaves and tender new shoots are hurt first. Tougher stem tissue and buds down from the tips endure less damage, but are not immune if the temperatures are lower and the duration is longer. Limp, dry and brownish leaves damaged by frost easily stand out, however damage to stems and buds remain hidden. Freeze damage to plants might not become evident for several months or even years.

With extremely low temperatures a plants survival may depend on their stage of growth and development. Low temperatures cause far more damage than high temperatures. Temperatures below freezing can kill buds on fruit trees and damage the succulent twigs of most trees. Low winter temperatures may kill young tree roots or cause bark splitting and canker development. The degree of chilling and frost injuries depends on the duration of the cold temperatures and how fast the temperature dropped.

So first let's understand cold weather:

- The sun warms the soil surface during the day; the heat is then radiated into the cool atmosphere during the night. The coldest time of day occurs just before daybreak.
- Clouds at night can absorb and reflect heat back to the earth.
- Wind can mix the ascending warm air with the descending cold air.
- Calm clear nights pose the greatest danger of frost.
- Humidity slows temperature change, which is why extremes between day and night occur so quickly in our dry desert climate.
- Cold air settles downward, hot air rises. Cold air may collect at the bottom of a slope, or in a valley.
- Cold winds compound temperature loss.
- Cold air is denser than warm air; cold air will layer beneath warmer air, forcing the warmer air to rise above it (inversion). These air layers may remain undisturbed if there is little to no wind. Areas where cold air frequently settles have been loosely termed “frost pockets”, even though they may or may not be associated with frost. Frost pockets tend to occur in the lowest point of a valley or in landscape depressions against the north or east sides of walls that impede the flow of air.
- Freeze or frost damage to plants is less likely to occur on sloping areas facing south or west. However, since these solar orientations are warmer, they tend to encourage earlier growth in the spring. This new growth is more susceptible to freeze or frost damage to a late spring freeze.
- Freeze damage can occur without frost. If temperatures are low enough to cause plant freeze damage but the relative humidity or moisture content of the air is very low, plant damage due to freezing temperatures may occur without the development of frost.

- Frost can sometimes form even if air temperatures are above freezing, referred to as “radiation frost”. Radiation frost is common during cloudless night. Ice crystals may form on plants and other objects when their surface temperature drops below freezing and sufficient moisture is in the air, but the actual air temperatures remain above freezing.
- Freeze damage is more extensive when low temperatures are combined with winds. Plants are not subject to wind chill factor, however wind can compound damage produced by freezing temperatures to woody plants.

The extent of damage to plants depends on several factors including:

- Types of plant - Tropical plants have few internal protection mechanisms against freezing temperatures. Semi-tropical plants can handle temperatures slightly below freezing.
- Where it was propagated or its origin – Climate zone.
- Plant maturity and health - Perennial plants can withstand much lower temperatures once they are well established than when they were first planted. Generally, older more mature plants can typically tolerate freezing temperatures better than juvenile plants
- Fertilizing practices – Borderline plants will survive low temperatures if they are not pruned or fertilized with nitrogen after about August.
- Presence of late summer growth - Pruning may stimulate late growth and the new growth will not have time to harden off before the first frost
- The lowest air temperature achieved – Usually air temperatures decrease as the nights grow longer. If temperatures drop below freezing for a very short period of time, damage to tender plants is typically minimal. If the same temperature is reached but maintained for several hours, freeze damage to plants is more severe.
- The month of the year freezing temperatures occurs – Freezing temperatures occurring early in the fall or late in the spring are usually more damaging to plants than freezing temperatures in mid winter.

- Plant parts exposed to freezing temperatures – The tenderest parts of plants are buds and flowers. A late frost just before blooming can eliminate most and sometimes all of the fruit and/or flowers for that season. The roots of plants are less cold hardy than stems and branches of the same plant. Stems and branches of some plants may tolerate temperatures to 20 degrees F, while roots of the same plant may tolerate little to no freezing temperatures. Wet soil serves as an insulator and provides protection for the roots. Roots of container plants, where there is a low volume of soil are more susceptible to freeze, than the roots of the same plant planted in the ground.
- Overall duration of the freeze. – Lasting hours or just a few minutes.

Protecting plants from freezing temperatures:

To protect woody landscape plants and fruit trees:

- ✓ Apply fertilizers at half rate in applying them during the summer months; eliminate nitrogen fertilizers after August 1st.
- ✓ Plants should enter the fall months as healthy as possible, but growth should be reduced.
- ✓ Irrigate plants adequately all season, but gradually reduce water frequency as colder temperatures approach..
- ✓ Woody plants that are likely to freeze should be mulched to protect the roots and crown.

To protect cacti and succulents:

- ✓ Damage to cacti and succulents usually occurs on the growing tips first. If you suspect a frost cover them with a frost blanket, sheet or other material. Note, these items should be removed during the day when temperatures are above freezing.

Other plants and vegetables:

- ✓ Use cold frames, hoop houses, hot-caps or water storage devices over and around plants. Note, these items should not be touching the plants.
- ✓ Move container plants into protected areas, and back out again when temperature rises.

- ✓ Water container plants (except succulents and cacti) just prior to freezing.
- ✓ Use wind breaks whenever possible.

What to do after danger of freezing has passed:

Trees and Shrubs - If possible, delay all pruning until after the danger of freezing weather has passed. Because leaving plant material that has already been damaged by a freeze may protect additional damage.

Recognizing how far down the stem damage has occurred takes a trained or just plain luck. Tissues may appear undamaged, but the damage lays hidden until spring growth appears. With this in mind many gardeners wait until new growth appears to find the exact point along the branch where damage stops. But remember, the more severe the damage the longer it takes older buds to emerge. Young undamaged buds break early, however buds lying in older parts of the plant need more warmth and stimuli to appear.

Now that you can identify the extent of damage, either cut about ½ inch above the bud if it's going the right direction, or go further down the branch and find a bud which is going the right direction. This extra care and proper cutting helps the plant by directing its new growth in the proper direction initially, thus eliminating additional pruning later.

Vines and Small Shrubs – Some plants may be killed all the way to the ground. If this is the case and you want to see if it will come back, make clean sharp cuts leaving about six inches of growth above the ground. Be patient; it may take three or four months for some plants to show new growth. If you use mulch around vines, rake back the mulch around the crown after freeze danger has passed. The light and warmth may hasten growth and a faster recovery.

Replace the mulch after strong growth is established.

Succulents and cacti – In the case of succulents and cacti with freeze damage, if bacterial rot symptoms are evident, prune the affected parts back to healthy tissue. Use sterilized tools (tools

dipped in one part bleach to ten parts water) to prevent the infection from spreading through the plant.

Delay pruning until the weather is warm and all danger of frost has passed.

Remember pruning is tough on plants. The more pruning you do the more energy the plant must expend to heal the wound, thus robbing energy for new growth and flowering.

NOTE: Kingman Area Master Gardeners will be presenting a Pruning Fruit Trees workshop on Saturday, January 17, 2009 at the S & R Farms in Golden Valley, from 10:00 AM to 12:00 Noon.

For more information contact The University of Arizona Mohave County Cooperative Extension at 101 E. Beale Street, Kingman or telephone (928) 753-3788.

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