



Central Valley Small Farms & Specialty Crops

UC Cooperative Extension Fresno County

Newsletter December 2007

FROST PROTECTION:

January 2007 was a month for the history books. Temperatures as low as 22° F. were recorded in Parlier on January 16 (19 days 30 and below), 17° in Five Points and 14° in Firebaugh on January 14.

Many cool season crops suffered 70% loss or more. Historical temperatures can be obtained from various sites throughout the county on the IPM website at UC Davis - <http://www.ipm.ucdavis.edu/>. While we have had a few light freezes (26° & 26° on December 1,2), most of the other dates have been in the high 20's to low 30's.

As seen above, the temperatures ranged from lows of 14-22° depending on the location in the county, high spots, low spots, and other factors. Each farmer with something in the ground should have a minimum-maximum thermometer at the least. Several companies that sell minimum-maximum thermometers in Fresno County include Graingers, Fresno Ag, and many nurseries.

Check the calibration of the thermometer by immersing it into an ice-slush mixture – the temperature should read 32°. Note the difference and write on the thermometer the difference.

WHAT CAN YOU DO?

Water freezes at 32, but most fleshy plants freeze at a lower temperature which might be 30 or 28 depending on dissolved solids in the plant part. Depending on when the freeze occurs and what crops are in the ground, the following measures may help:

- Site location is one of the best ways to prevent freeze damage. Cold air drains downhill.
- Plant crops in trenches so the surrounding soil mass protects the plants.
- When grass or weeds are present in an orchard or vineyard, sunlight is reflected from the surface and less energy is stored in the soil. Therefore, the crop is more prone to freeze damage. Vegetative mulches usually reduce the transfer of heat into the soil and hence make crops more freeze prone.
- Clear plastic mulches that increase heat transfer into the soil typically improve heat storage and hence provide passive freeze protection. Black plastic mulch is less effective for frost protection.

- Use high beds so that if water must be turned on the plants are not in waterlogged soil.
- Row covers (Remay, Typar, Agribon) may help warm temperatures up to 8° depending on the thickness. The thicker the cover, the less light transmittance. These are expensive \$500-\$800/acre.
- Sprinklers: Use the heat released when water changes to ice. Water must be continuously provided. As long as ice is being formed, heat is being released; so some ice is desired, too much is bad. Even if the sun is shining on the plants and the air temperature is above the melting point (0°C or 32°F), sprinklers should not be turned off unless the wet-bulb temperature is above the critical damage temperature.
- Irrigate just before a freeze. A moist soil can hold 4 times more heat than a dry soil. In one experiment, the temperature above a wet soil was 5° higher than above a dry soil. Running water down the furrow continuously also raises the temperature as the water gives off heat. Surface irrigation should be started early enough that the water reaches the end of the field before the air falls to the critical damage temperature.



- Helicopters - A helicopter should pass over the entire crop every 30 minutes during mild freezes and more often during severe freezes. Helicopters move warm air from

aloft in an inversion to the surface. If there is little or no inversion, helicopters are ineffective.

- Sprays: Buyer Beware. There is not a lot of scientific evidence that the liquid sprays help reduce freeze damage.
- Heaters (return stack heaters – smudge pots) were used extensively in citrus and other crops in the past; but because of air quality issues and cost, they are no longer practical. Heaters are less efficient when there is no inversion. 20-40 heaters/acre = 5° of protection.
- Wind machines are more often seen in orchards but would also work in vegetables. They work best when there is an inversion layer with warm air above. A single wind machine can protect 5-10 acres.

Crop differences to frost injury:

Tender crops. Damaged by the first frost – mid to high 20's.

Beans
Cucumbers
Summer squash

Semi-hardy crops. Can stand a light frost.

Beets
Chinese cabbage
Collards
Irish potatoes
Bibb lettuce
Mustard
Radishes
Spinach
Swiss chard
Leaf lettuce

Hardy Crops. Can stand several frosts, but harvest before 20° F temperatures.

Cabbage
Broccoli
Cauliflower
Brussels sprouts
Carrots
Turnips
Kale

Root crops such as beets, carrots, potatoes, and turnips may be mulched and protected.

Much of the above information can be found in the free on-line publication by Dr. Rick Snyder – “Principles of Frost Protection” <http://biomet.ucdavis.edu/frostprotection/Principles%20of%20Frost%20Protection/FP005.html>.

“Microsprayer Frost Protection in Vineyards” by G. Jorgensen is another good reference, <http://cati.csufresno.edu/VERC/rese/96/9608/03/>.



TREE SENSITIVITY:

Dormant trees are generally not a problem; and, in fact, require a certain amount of winter chilling below 45°. Citrus and avocados, on the other hand, can be damaged. When temperatures fall below 29° for 30 minutes or longer, some frost damage will occur on tender foliage.

Within citrus:

Lemon, lime, citron = highly sensitive
Grapefruit, orange, mandarins = moderately
Kumquat, Satsuma mandarins = low

Avocados:

Hass, Nabal = sensitive
Fuerte, Zutano = moderate
Mexicola, Duke, Bacon = hardy

In the spring, deciduous trees with buds can be damaged.

Critical Temperature °F Endured for <30 Minute

	<u>buds closed</u>	<u>full bloom</u>	<u>fruit</u>
Apple	25	28	29
Apricot	25	28	31
Cherries	28	28	30
Peaches	25	28	30
Plums	25	28	30

* Kevin Day, UCCE Tulare County



BLUEBERRIES:

During the winter, dormant flower buds of highbush blueberries will survive temperatures as low as -20 to -30 °F while the less hardy rabbiteye (*V. ashei* Reade) have survived -10 °F but are often damaged below 0 °F. As flowerbud swell progresses, cold tolerance decreases.

By the time individual flowers begin to protrude from the bud, temperatures below 20 °F will begin damaging the most exposed flowers. When corollas have reached half of their full length, temperatures below 25 to 26 °F will kill the complete flowers.

When the blossoms are open, a temperature of 27 °F for more than a few minutes causes damage. Immediately after corolla drop and before the berry begins to swell is the most sensitive stage. A few minutes below 28 °F will result in damage. As the berry begins to enlarge, susceptibility is similar to the critical temperature of 28 °F for open blossoms.

Source: **Blueberry Freeze Damage and Protection Measures** – NC State University

**UNIVERSITY OF CALIFORNIA
COOPERATIVE EXTENSION**
County of Fresno
1720 South Maple Avenue
Fresno, CA 93702

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HAPPY NEW YEAR

Richard Molinar
Farm Advisor, Specialty Crops & Family Farms

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
1720 S. MAPLE AVE. - FRESNO, CA 93702
PHONE: (559) 456-7557
FAX: (559) 456-7575



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