Saving Your Crop: How Do You Know When to Ice It?

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Freeze Events

FREEZE TYPE	CHARACTERISTICS
Radiation	Clear sky; calm; inversion
Advection	Windy (above 5 mph); no inversion

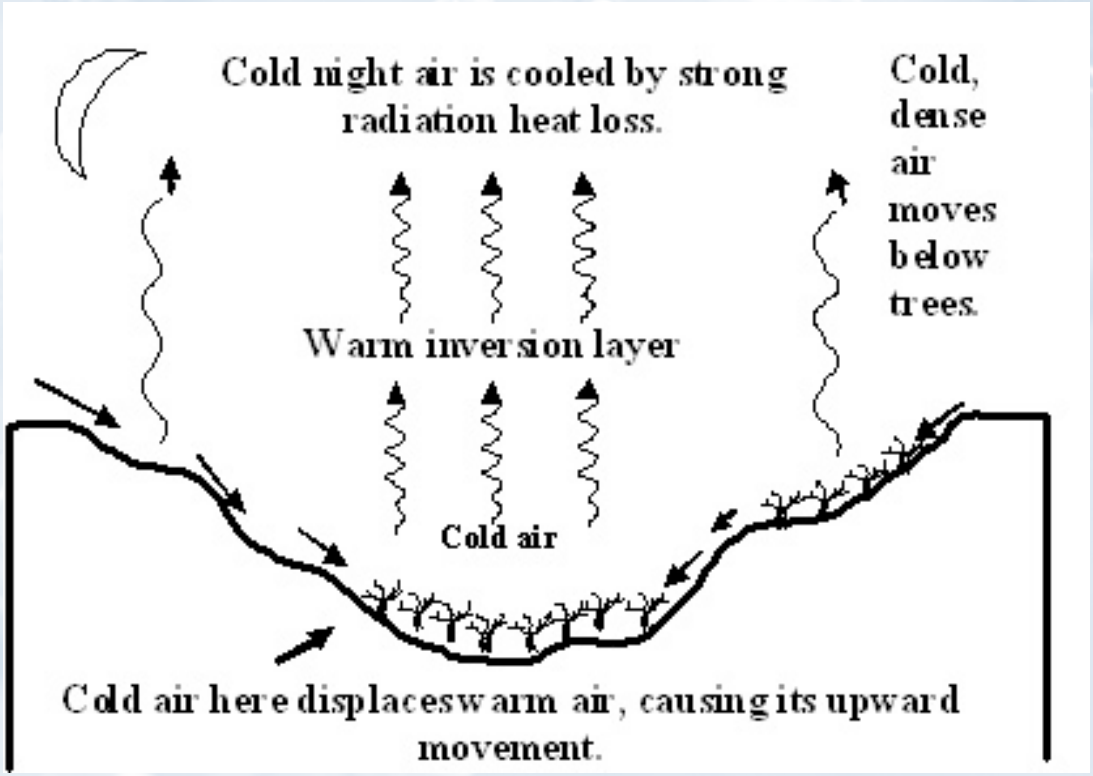


Image source:
http://athenaeum.libs.uga.edu/bitstream/handle/10724/12306/C741.htm?sequence=1

Cold-Hardiness

- Deciduous fruit trees harden against freezing when exposed to periods of cold temps
- Major factors in bud death
  - Steep drops in temperature
    - Function of environment
  - Bud stage
  - Reproductive buds vs. vegetative buds

Importance of Research

- Knowledge of bud critical temps for each developmental stage can aid in:
  - Orchard design
  - Crop management
  - Weather alert system

Photo sources: http://www.post-gazette.com/business/businessnews/2012/03/28/Growers-are-optimistic-about-fruit-orchards-after-deep-freeze/stories/201203280200 & http://edis.ifas.ufl.edu/hs348#FIGURE%2013

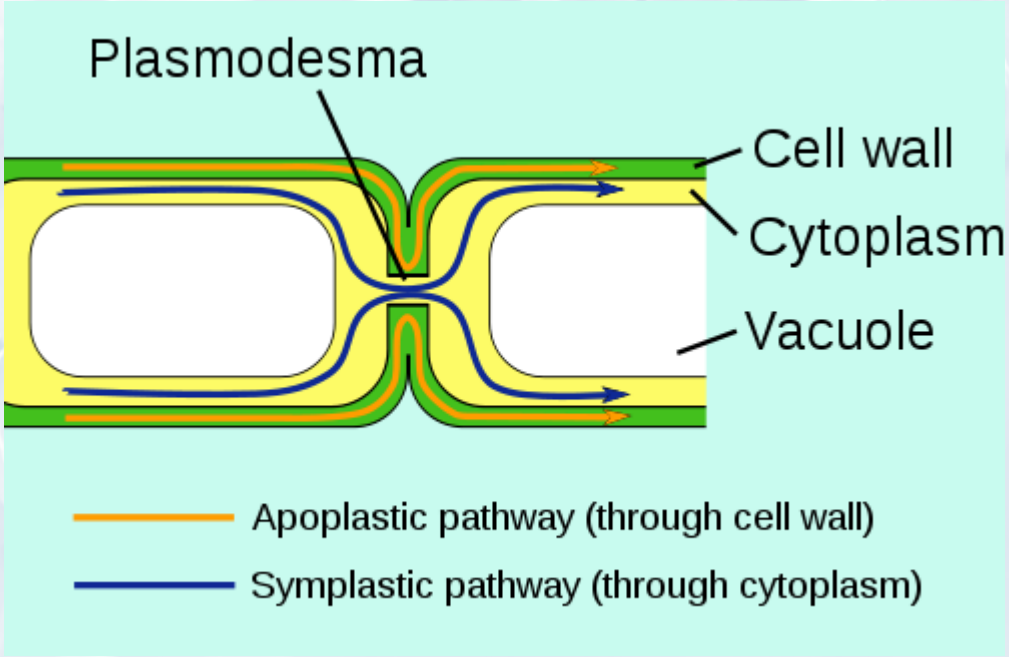
Objectives

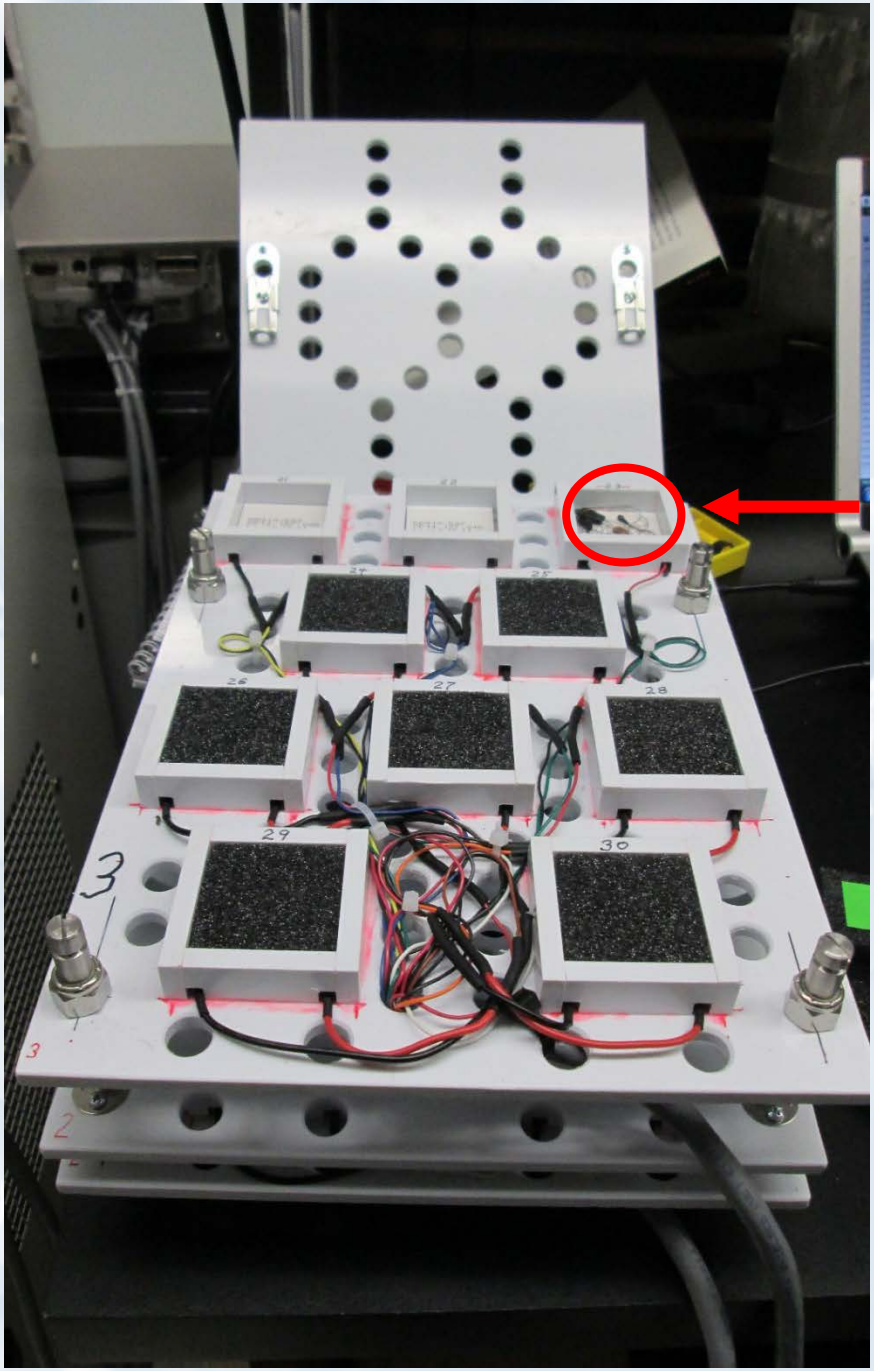
To identify the critical temperatures of peach buds at different development stages, using differential thermal analysis and a traditional cold exposure method for assessing cold damage

Methods & Materials

Differential Thermal Analysis (DTA)

- Technique used to quantify cold tolerance in plants
- Identify freezing episodes (exotherms) from inflection points of differential temp. data





- Buds placed on module
- Thermoelectric modules detect heat differences
- 10 modules per tray

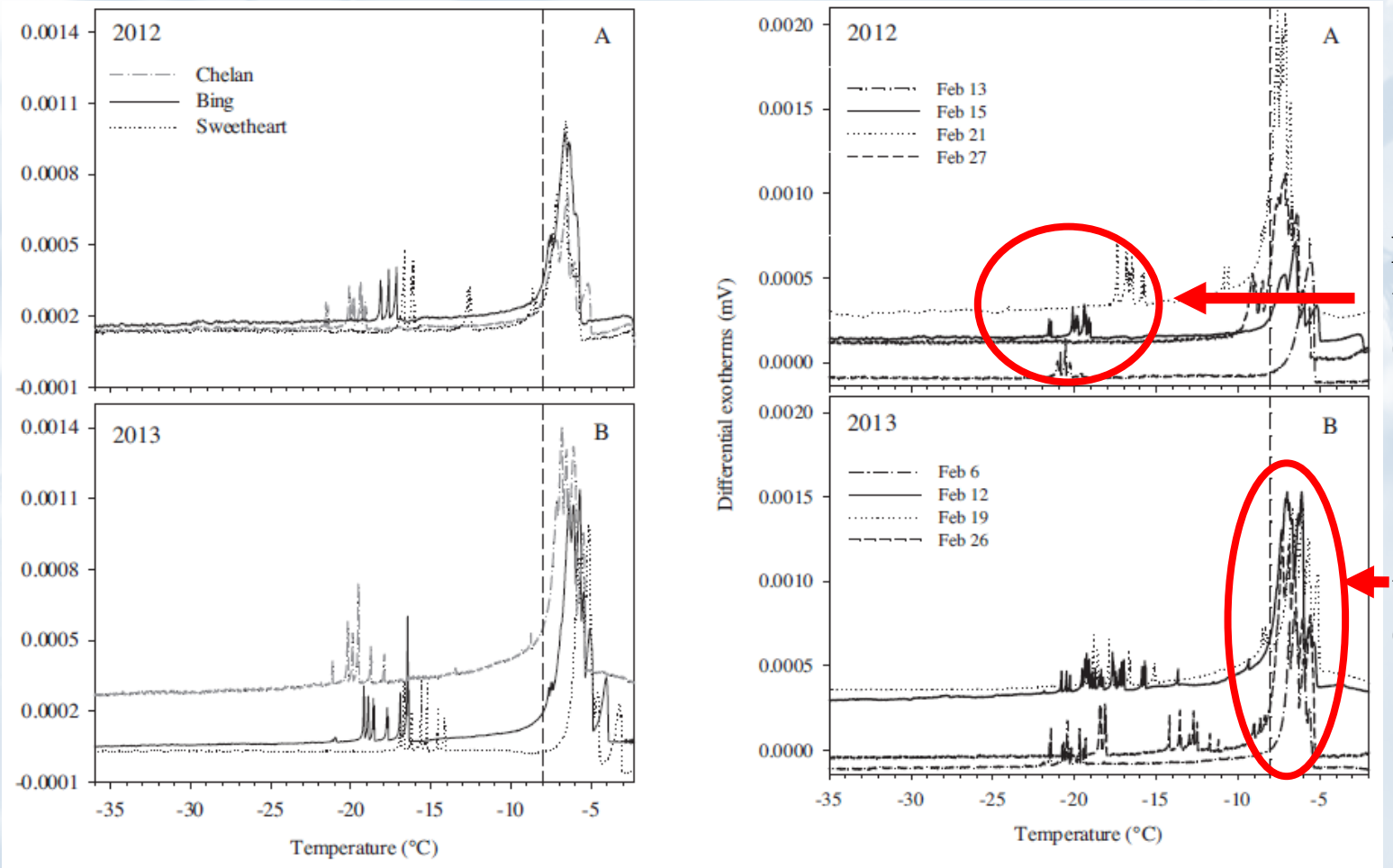
- Stack 4 trays in the programmable freezer

Methods & Material

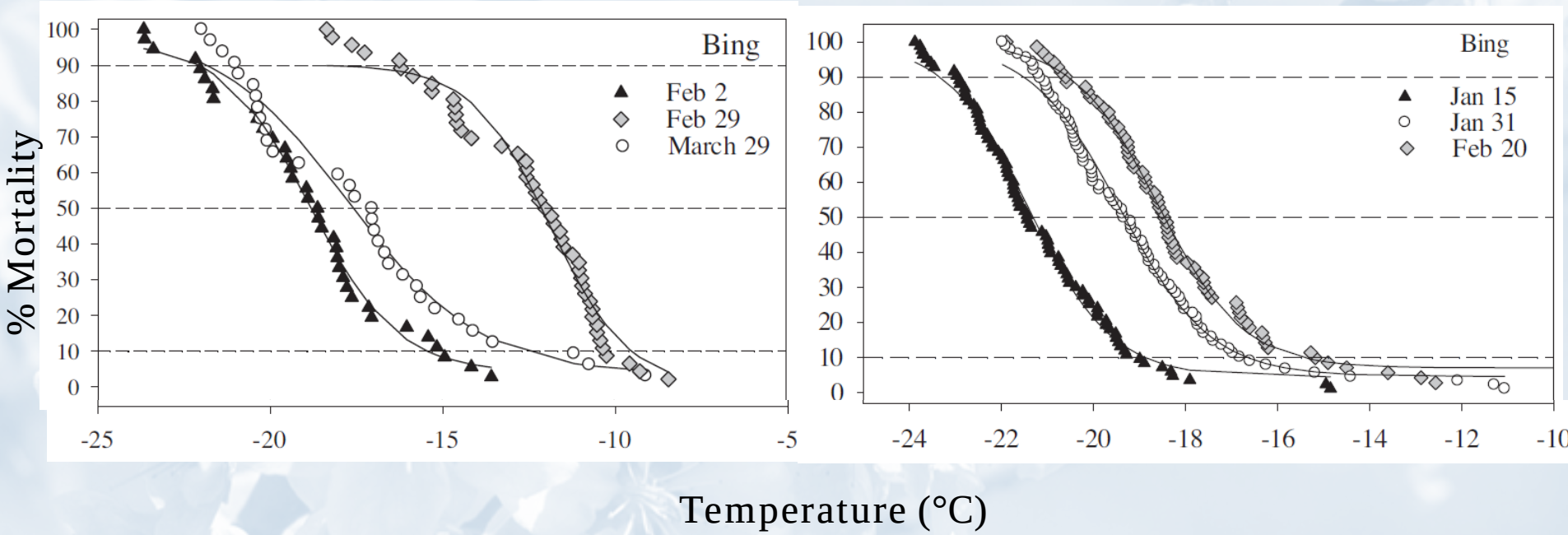
Differential Thermal Analysis (DTA)

- Freezer programmed for cooling rate 4°C/hr (~7°C/hr)
- Signals recorded in Excel
- Tissue dissection to confirm injury

Example: Cherry Exotherms

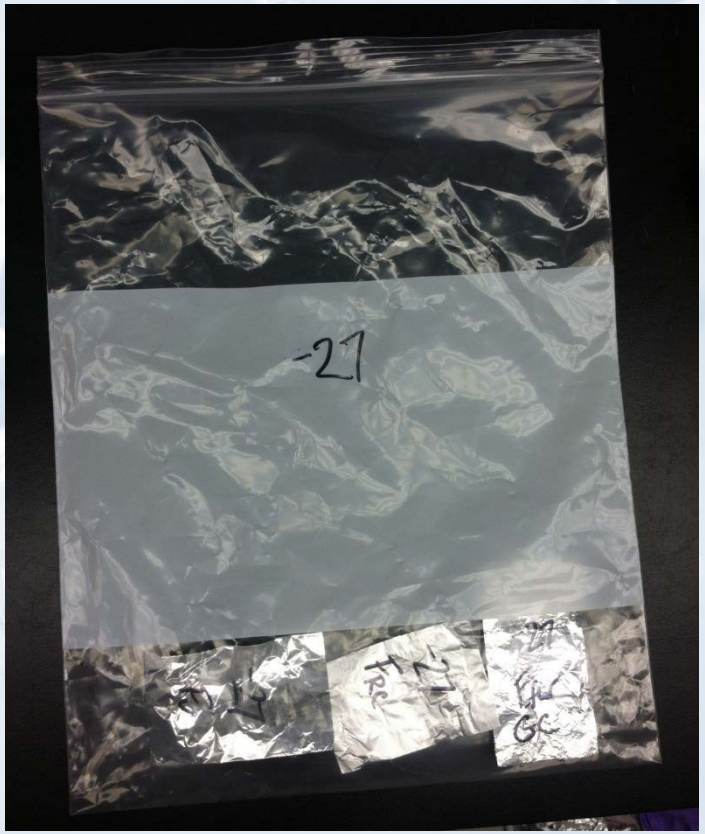


Example: Cherry Mortality Curve



Methods & Materials

Controlled freezing



Dissection

Brown/black pistil sign of bud death

WASHINGTON STATE UNIVERSITY

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Cold Hardiness Warning

Cold hardiness tests performed this week on apple and cherry samples in Benton County suggest a risk of damage to cherry buds due to pending cold temperatures. While orchard management practices affect cold hardiness, there is currently a risk that temperatures will pass the threshold where damage to buds is likely to occur.

The following tables show critical injury temperatures for apple and cherry buds. LT 10 is the temperature at which 10% of the primary buds will be killed; LT 50 and LT 90 refer to 50% and 90% bud damage, respectively.

Apple Samples

Location	Date Sampled	Cultivar	LT 10	LT 50	LT 90
Prosser (Roza)	March 18, 2013	Fuji	20.4 °F	15.5 °F	10.3 °F
		Gala	19.2 °F	15.0 °F	10.6 °F
		Red	18.3 °F	14.5 °F	10.3 °F

Cherry Samples

Location	Date Sampled	Cultivar	LT 10	LT 50	LT 90
Prosser (Roza)	March 18, 2013	Bing	23.8 °F	16.7 °F	8.7 °F
		Chelan	27.0 °F	19.1 °F	10.9 °F
		Sweetheart	26.6 °F	18.8 °F	10.2 °F

- From dormancy to fruit set, the flower bud undergoes a number of developmental stages that are associated with a progressive increasing vulnerability to low temperatures.
- Freeze tolerance was analyzed using differential thermal analysis, this technique is only effective for cherries at early stages of bud development.

Source: http://weather.wsu.edu/awn.php?page=warning20140321

Freeze Protection Survey

UF | IFAS Extension
UNIVERSITY of FLORIDA

A Survey of Frost Protection Practices for Florida Low-Chill Peaches

This study is conducted by the University of Florida (UF) Cooperative Extension Service. The goal is to help low-chill peach growers to develop frost protection strategies better tailored to critical low-temperature events. If you need further information about this study, please contact Dr. Mercy Olmstead, Department of Horticultural Sciences, UF, at 352-273-4772 or at 2135 Fifield Hall, Gainesville, FL 32611. Thank you for participating in the survey!

1. **How many peach varieties do you grow on your farm?** *Select one answer.*
   - ○ 1 variety
   - ○ 2 varieties
   - ○ 3 varieties
   - ○ > 3 varieties

2. **What is the most common peach variety grown on your farm?** *Select one answer.*
   - ○ UFSun
   - ○ UFBest
   - ○ TropicBeauty
   - ○ UFGem
   - ○ Other (*please list*) _____

3. **For an average production season, what percentage of flower buds can you lose due to freeze damage and still cover your production costs?**
   - ○ up to 10%
   - ○ 11 - 20%
   - ○ 21 - 30%
   - ○ 31 - 40%
   - ○ 41 – 50%
   - ○ 51 - 60%
   - ○ 61 - 70%
   - ○ more than 70%

4. **Did you apply hydrogen cyanamide (tradename 'Dormex' or 'BudPro') this season (Fall 2014-Spring 2015)?**
   - ○ Yes
   - ○ No

Questions?

Contact: econlan@ufl.edu