PECAN!!

- Have medicinal and nutritional properties
- Native to northeastern North America
- USA produce 80% of world’s pecan market

Production of Pecan nuts in USA

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Spring Freeze:

- During spring the pecan bud breaks the dormancy and starts to enlarge and grow, is most susceptible to environmental changes.
- An unexpected ‘The 2007 Easter Freeze’ event occurred on 5-9 April caused severe damage to a wide region of the eastern United States.
- Even a single incident of spring freeze can cause drastic loss in production.

- Opening flowers are exposed to freezing temperatures.

Pecan bud and inflorescence damage after Spring Freeze.

Wood, B.W. (2011); Gu et al. (2008)
Cultivars - Kanza, Pawnee, and Maramec

Two growth stages -

1) Branch with buds at outer bud scale shed stage
2) Bloom stage

## Treatments

5 different temperatures (-6, -2, 0, 2, and 4 °C),

2 durations (4 and 8 hours) using **Conviron E8 Freezing Unit**, and control

### Conditions inside the growth chamber

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<th>Relative Humidity (%)</th>
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Objective: To Find The Threshold Temperatures And Tolerance Range Of Pecan Buds And Flowers To Spring Freeze
Observations After bloom:

1) Stigma structure - SEM

2) Stigma receptivity - Microscope
- Benzidine-Hydrogen peroxide (H₂O₂) test
- Collect the pistils
- Stain for 10-15 minutes
- Observe under Microscope
- Appearance of air bubbles and color of the solution

3) Ovule viability - Microscope
- Flower fixation - FAA solution
- Flower tissues - rinsed with distilled water three times for 30 minutes each and then transferred to 5 N NaOH solution
- After tissues softening, samples will be transferred to a 0.01% Aniline Blue solution and left until the pistils become transparent
- Whole pistil - placed on a slide with 1-2 drops of 50% glycerol and then squashing with a cover slip
- Leica TCS SP2 Confocal Microscope

Scales of Ovule viabilities

Chen et al., 2013
Zhang et al., 2018
SPRING FREEZE RESULT 1: OUTER BUD SCALE SHED STAGE

- All of the -6°C and all of the -4°C treatments
  - no leaves or female flower development
Spring Freeze Result 2: **At bloom stage**

- Cold temperature treatment at bloom stage
- Stigma **papillary cells collapsed**
- Cannot accept pollen

**Control** Stigma Papillary Cells

**Treatment:** 4°C 4 hours
Stigma Papillary Cells
Spring Freeze Result:

- The poor development of both buds and flowers by \(-6^\circ C\) and \(-4^\circ C\) treatments
- A wider temperature range than our previous perception of spring freeze causes effective damage to pecan flowers

4°C for 4 hours

Future Experiments:
- Continue the experiments and will observe Stigma receptivity and Ovule Viability
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References