### Why can’t I grow

<table>
<thead>
<tr>
<th>Fruit Type</th>
<th>Reason Unsuited for Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangos, Papayas, Guava, Cashew &amp; other Tropicals</td>
<td>Growing Season &amp; frost free days too short</td>
</tr>
<tr>
<td>Bananas</td>
<td>Length of time to flower and mature fruit (10-15 months); Frost susceptible</td>
</tr>
<tr>
<td>Sweet Cherries</td>
<td>Insufficient chilling, fruit cracking of fruit, birds</td>
</tr>
<tr>
<td>Figs (Mauveurs)</td>
<td>Eastern Filbert blight, extreme temperatures, chilling, frost</td>
</tr>
<tr>
<td>European Pears (Bartlett)</td>
<td>Fireblight disease, insufficient chilling</td>
</tr>
<tr>
<td>English Walnuts</td>
<td>Bacterial Walnut Blight, high chill requirements (some varieties)</td>
</tr>
<tr>
<td>Pistachios</td>
<td>High chill requirement, need for dry conditions at harvest</td>
</tr>
<tr>
<td>Almonds</td>
<td>Bacterial leaf spot, brown rot, low chilling, response to warm spring &amp; frost damage</td>
</tr>
<tr>
<td>Loquat</td>
<td>Fall, winter blooming—freeze damage to fruit</td>
</tr>
<tr>
<td>Kiwifruit</td>
<td>Mid-winter and spring freeze injury, not adapted to summer heat, wind</td>
</tr>
<tr>
<td>Raspberries</td>
<td>Perform poorly in extreme summer heat</td>
</tr>
</tbody>
</table>
What are Chill Hours?

Chilling Hours / First and Last Frost

<table>
<thead>
<tr>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Hrs &lt;=32</td>
<td>No of Hrs &lt;=45 F</td>
</tr>
<tr>
<td>62</td>
<td>99</td>
</tr>
<tr>
<td>83</td>
<td>97</td>
</tr>
<tr>
<td>354</td>
<td>360</td>
</tr>
<tr>
<td>214</td>
<td>107</td>
</tr>
<tr>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>852</td>
</tr>
</tbody>
</table>

Mississippi State Univ.

webapps.msucares.com/chill_hours/

- Notes:
  - Chill Hours for KTXBELT023 for Oct-01-2017 thru Aug-12-2018:
  - Below 45 Model = 967
  - Between 32 and 45 Model = 778
  - First Below 45 day: 2017-10-17 06:20:00
  - Last Below 45 day: 2018-04-16 07:42:00

Texas Chilling Regions

Varieties or species with too low chilling requirement for the region resume growth too quickly and are a spring frost liability.

Too high chilling requirement results in poor production, growth & fruit quality.
Drupe Fruits

Peaches
Olives
Plums
Jujube

The Drupe

Peaches in Texas
Soil requirements

Well-drained—Avoid heavy clays. pH 6.0–7.0; Iron chlorosis when pH > 7.5. Raised beds or berms are good.

Soil pathogen concerns: nematodes, copper root rot, armillaria root rot

Rootstocks

• Lovell & Halford—better on clay soils and high pH, but susceptible to nematodes.
• Myrobalan plum—for noncommercial trees where poorly drained soils or oak root rot is a problem.
• Nemagurad—For nematode problems.

Pruning of Peach Trees
Open Vase Pruning

How a pruned tree should look.

Spring is tough time to grow peaches in Texas

Photo: Michael Potter, CEA-HORT, Montgomery Co.
Symptoms of Insufficient Chilling

- Abnormally shaped fruit & faster deterioration
- Reduced Yield
- Sparse and delayed foliage development

### Symptoms of Insufficient Chilling

**Stage** | **LT 10 %** | **LT 90 %** | **LT – Lethal Temperature**
---|---|---|---
First Swell | 28 (°F) | 1 (°F) | 
Caylx Green | 21 | 5 | 
Caylx Red | 23 | 9 | 
Pink | 25 | 15 | 
Bloom (early) | 26 | 21 | 
Bloom (late) | 27 | 24 | 
Post Bloom | 28 | 25 | 

Symptoms of Insufficient Chilling:
- Kamas
- Sparse and delayed foliage development
- Reduced yield
- Abnormally shaped fruit & faster deterioration
Excess fruit load leads to small peaches and broken limbs

Reduce the Fruit Load
Peach Variety Considerations

- Chill hours & ripening date.
- Freestone vs Clingstone
- Color—Yellow, Red, White
- Shape—Tip and suture prominence
- Firm vs. Melting flesh
- Sugar and acid levels
- Disease resistance

Chilling differences among medium & low chill peaches

<table>
<thead>
<tr>
<th>Variety</th>
<th>Medium-Chill Requirement</th>
<th>Stone Freeness</th>
<th>Days Before Elberta 'Flordacrest'</th>
<th>Medium-Chill Varieties</th>
<th>Clingstone</th>
<th>Days Before Elberta 'Flordakings'</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Flordacrest'</td>
<td>425</td>
<td>Semi-Cling</td>
<td>55</td>
<td>'Flordaking'</td>
<td>Cling</td>
<td>51</td>
</tr>
<tr>
<td>'Flordaking'</td>
<td>450</td>
<td>Cling</td>
<td>46</td>
<td>'Goldprince'</td>
<td>Cling</td>
<td>42</td>
</tr>
<tr>
<td>'TexKing'</td>
<td>450</td>
<td>Cling</td>
<td>42</td>
<td>'Juneprince'</td>
<td>Semi-Free</td>
<td>35</td>
</tr>
<tr>
<td>'Texstar'</td>
<td>450</td>
<td>Semi-Free</td>
<td>32</td>
<td>'Southern Pearl'</td>
<td>Free</td>
<td>28</td>
</tr>
<tr>
<td>'TexRoyal'</td>
<td>600</td>
<td>Free</td>
<td>25</td>
<td>'Suwanee'</td>
<td>Free</td>
<td>22</td>
</tr>
<tr>
<td>'TexPrince'</td>
<td>550</td>
<td>Free</td>
<td>20</td>
<td>'La Feliciana'</td>
<td>Free</td>
<td>18</td>
</tr>
<tr>
<td>'Gulfking'</td>
<td>350</td>
<td>Cling</td>
<td>6</td>
<td>'Flordacrest'</td>
<td>Cling</td>
<td>-0-</td>
</tr>
<tr>
<td>'Flordaprince'</td>
<td>375</td>
<td>Cling</td>
<td>4</td>
<td>'Gulfprince'</td>
<td>Semi-Free</td>
<td>+25</td>
</tr>
<tr>
<td>'FlordaPrince'</td>
<td>150</td>
<td>Cling</td>
<td>0</td>
<td>'FlordaPrince'</td>
<td>Cling</td>
<td>-0-</td>
</tr>
<tr>
<td>'TropicPrince'</td>
<td>150</td>
<td>Cling</td>
<td>7</td>
<td>'TropicBeauty'</td>
<td>Semi-Free</td>
<td>+14</td>
</tr>
<tr>
<td>'TropicBeauty'</td>
<td>150</td>
<td>Semi-Free</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

White Delight Peaches

- Late June - Early July
- Chill: 700
- Flavor: Subacid

Slide Credit: Dave Byrne
Smooth Texan One
Mid May
Chill: 550
Flavor: Sweet Acid

Flat, Saucer or Donut Peaches

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bloom</th>
<th>Ripe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Delight One</td>
<td>Feb 28</td>
<td>May 25</td>
</tr>
<tr>
<td>Flat Delight Two</td>
<td>Feb 26</td>
<td>June 02</td>
</tr>
<tr>
<td>June Gold</td>
<td>Mar 13</td>
<td>June 04</td>
</tr>
<tr>
<td>Galaxy</td>
<td>Mar 10</td>
<td>June 22</td>
</tr>
</tbody>
</table>

Nectarines

Varieties
- *Karla Rose*: 600 chill hours
- *Redgold*: 850 chill hours
- *Rose Princess*: 450 chill hours
- *ArmKing*: 550 chill hours
- *Sungem*: 425 chill hours (Univ of Alabama)
Plums

Culture
May require a pollinator
Care and Pruning:
   the Same as Peaches

Diseases
Plum Curculio
Peach Twig Borer
Stink and Leaf footed Bug
Leaf curl
Brown rot
Bacterial Leaf Spot

Varieties
Bruce
Morley *
Morris
Ozark Premier *
Santa Rosa

* Self Pollinating

Mexican Plum

A small to medium tree
Exposure: sun partial sun
Flower Color: white
Blooming Period: spring
Fruit round purplish drupes (plums)
Height: to 25 ft. Width: to 25 ft.
Heat Tolerance: medium
Water Requirements: medium low
Soil Requirements: adaptable
Apricots

**Varieties**
- Tisdale: about 600 chill hrs.
- Blenheim: 500 chill hrs.
- Moorpark: 6 – 700 chill hrs.
- Bryan: 700 chill hrs.
- Chinese (or Mormon): 700 hrs.

Pruning the Apricot

- Tysdale Apricot
- Two yr. old from planting
Prunus Hybrids

Plumcots, Pluots, Apriums

Growing Cherries

Royal Lee  Chill Hrs. 2-300
Minnie Royal  Hrs. 4-500
Stella  Hrs. 5-600
Montmorency  Hrs. 6-700

Almonds

The variety most common in Texas
"All-In-One"
Olives

- **Arbequina**: Most planted in Texas to date
- **Arbosana**: Only moderate cold tolerance
- **Frantoio**: Has low cold tolerance
- **Manzanilla**: From Spain, a table olive, needs a pollinator
- **Mission**: Developed in US, good cold tolerance
- **Pendolino**: Usually grown only as a universal pollinator

---

**Olive Harvesting**

---
Jujube (Chinese Date)

Recommended Varieties, Lang, So, Sugar Cane, Chico

Pome Fruit

Apple  Pear  Persimmon

The Pome Fruit

remnants of calyx
hypanthium
seed within ovary (cone)
flower stalk (pedicel)

Pome (ovary surrounded by fleshy hypanthium)
e.g. apple (Malus domestica cv. ‘ gala’

8/21/18
Apple

Culture
Three sizes
Standard, semi-dwarf
dwarf
Prune to a central leader
One fruit/cluster
Require Cross Pollination

Insects/Diseases
Fire Blight
Cotton Root Rot
Apple Maggot
Codling Moth
Scab

Varieties
Pink Lady (5-600 hrs.)
Red Delicious
Golden Delicious (7-800 hrs.)
Gala (140-160 days, 600hrs.)
Jerseymac
Mollie’s Delicious (500-600hrs.)
Fuji (140-160 days, 5-600 hrs)
Granny Smith (400 hrs.
Univ. Pollinator)
Ein Shemer (400 hrs.)

NOTE: Different Web sites list
differing chill hours for Apples

Pears

Culture
Choose Fire Blight Resistance
Generally 15 feet tall
Prune to a central leader
Some Require 2 varieties for pollination

Insects/Diseases
Fire Blight
Cotton Root Rot

Varieties
*Kieffer
*Orient #
Warren #
Ayres #
*Moonglow #
**Asian Li #
**Shinko #

Persimmons
Blackberry Culture

Berries

Dewberries—*Rubus* spp.

- Several species
- Some are dioecious male and female
- Early flowering, short maturation
- Predominantly trailing
Thornless Erect Blackberry

Growth forms

Bramble fruit

PERICARP
SEED
DRUPELET
RECEPTACLE
STAMEN
SEPAL
Soil-Site Considerations

- Widely adapted to soils
- Good internal drainage is preferable
- pH range 5.5 to 7.5
  - Iron deficiency will be a problem at high 7-8 range.
- Plant spacing is arbitrary (wide to high density), depends on goals for berry production.

Iron deficiency

- High pH soils.
- Correct with iron chelate, foliar & soil

Caneberry Botany

- Primocane; vegetative, usually non-flowering; grows from the crown in the current season.
- Floricane; fruiting, one year-old; bears current season fruit crop; then dies.
Regular watering and summer fertilizer encourage vegetative growth.

Three Categories of Blackberries

- **Thorny**: Rust resistant, double blossom susceptible, heavy yielding, large fruit.
- **Thornless**: Double blossom resistant, rust susceptible, moderate yielding, medium-sized fruit.
- **Primocane Bearing**: Late Summer, Fall Bearing; Poorly adapted to Hot Climates.
Arkansas Thorny Varieties

- Shawnee—1983
  - Heavy bearing, soft fruit
  - 7-8 g/berry
- Choctaw—1989
  - Early, med good size, small seeds
  - 5 g/berry
- Chickasaw—1998
  - Large size, disease susceptible
  - 10-11 g/berry
- Kiowa—1996
  - Very large fruit, good firmness
  - 11-13 g/berry

Thornless Berry Size

<table>
<thead>
<tr>
<th>Variety</th>
<th>Chilling Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arapaho</td>
<td>500</td>
</tr>
<tr>
<td>Natchez</td>
<td>500</td>
</tr>
<tr>
<td>Ouachita</td>
<td>300</td>
</tr>
<tr>
<td>Navaho, Apache</td>
<td>800</td>
</tr>
</tbody>
</table>

Thornless Berry Size

- Arapaho; 5 g
- Navaho; 5 g
- Apache; 8-10 g
- Ouachita; 6 g
- Natchez; 8-9 g
- Kiowa; 11-13 g (Not Thornless)
White Drupelet

High Sunlight, low humidity???

APACHE=Worst Known Problem

Double Blossom Rosette

Thorny Types Most Susceptible

Orange Rust [Gymnoconia peckiana]

Thornless Types Most Susceptible
Primo-Cane Bearing

- Prime-Jim—2004
- Prime-Jan—2004
- Prime ARK 45—2009
- Prime ARK Freedom—2013 (Thornless)

Adaptation to high summer heat of Texas is marginal. Future is unclear!

What do the terms Dioecious and Monoecious mean?

Dioecious – Distinct Male and Female Plants

Monoecious – Both Male and Female flowers on the same Plant

Grape Production
Native Grapes of Texas

- V. acerfolia (mapleleaf grape)
- V. aestivensis (summer grape)
- V. arizonica (canyon grape)
- V. champinii (Champin's grape)
- V. chervon (graybark grape, winter grape)
- V. monticola (sweet mountain grape)
- V. mustangensis (mustang grape)
- V. palomene (catbird grape)
- V. ripario (riverbank grape)
- V. retundifolia (muscadine grape)
- V. rupestris (sand grape)
- V. vulpine (frost grape)

Why doesn't my grapevine produce fruit?

Perfect Flower  Female Flower  Male Flower

Most wild grapes have either male or female flowers.

Grape Types

Grape types
- **Vitisina** – the Old World Grape, mostly California
  - Poor disease resistance
  - Need grafting onto resistant root stock
- **American** – the old Concord type, mostly eastern US
  - Moderate yields
  - Fair quality
  - Disease resistant
- **French x American hybrids**
  - Combination of Vitisina and American
  - Good yields, better quality
  - Better disease resistance
Is it a Bunch Grape or Muscadine?

Muscadines
- Smooth bark
- Few berries per cluster (<10)
- Large berries
- Thick skin
- Berries drop at maturity

Bunch Grapes
- Peeling bark
- Many berries per cluster
- No berry drop

Muscadines
- Scuppernong
- Berries drop at maturity

Bunch
- Bunch

Considerations for Selecting Varieties

- Disease susceptibility
- Heat/cold tolerance
- Soil tolerance
- Quality potential/use
  - Jelly, Wine, Table Grape, Juice

These hybrids don’t grow well in many areas of Texas
- Concord
- Niagara
- Catawba
Low Maintenance Grapes for Home Production

Red or Black Fruit
America
Ben Hur
Black Spanish (Jennoir)
Carman
Charpentier
Harlaimont (Some PD Resist.)
Lomanto
Norton (Cynthiana)
Victoria Red (Texas Superstar Table Grape)

White Fruit
Miss Blanc
Lake Emerald
Edna

Grape berries are most susceptible to fungal disease from 2 weeks pre-bloom through 6-weeks post-bloom. (2 weeks prior to veraison)

Veraison (ripening)

Pre-bloom

Planting the Vine

Most purchased vines are bare root
Usually 1 yr. plants
Grapes are typically grafted onto a rootstock
Plant in Jan or Feb
Space 12 feet apart
Grapevines have a low nitrogen requirement relative to many other crops
• Early spring (before May) fertilization is preferred
• Avoid nitrogen just before bloom, and late season (September or later)

1 cup of 13-13-13 per vine or 1/2 cup of ammonium sulfate, half that amount for new vines.
Spread fertilizer in 12-18” ring around trunk
Its better to under-fertilize than over-fertilize

Over-fertilization can lead to:
- Excess growth
- Delayed ripening
- Reduced fruit quality
- Reduced fruit production
- Fungal disease

Irrigating Grapevines

Grapes are relatively drought tolerant
- Drip irrigation is preferred over sprinkler (leaf wetting encourages fungal disease)
- Water 1 or 2 times per week in summer depending on soil water holding capacity and weather

Pruning during Dormancy
Pruning during Dormancy

Grape Harvester

Strawberries
Strawberries

Chandler

- Fruit Size: Medium to Large
- Pollination: Self-pollinating
- Ripens/Harvest: June
- Soil pH: 5.5-6.5
- Years to bear: 1-2

Sequoia

- Fruit Size: Large - Extra Large
- Pollination: Self-pollinating
- Ripens/Harvest: June
- Soil pH: 5.5-6.5
- Years to bear: 1-2

Blueberries

- Varieties: Tifblue, Brightwell, Powderblue, Climax, Premier

Soil Mix

4 parts Peat Moss, 1 part Pine Bark, 1 Part Perlite

Water with Rain Water (pH of 5.6 – 5.8)

Use a 20 - 25 gal. or larger container like a ½ barrel.
Figs

Culture
Closed eye varieties
Prune/Train as a tree or shrub
Full Sun
Self Pollinating

Varieties
Brown Turkey
Texas Everbearing
Black Mission
Alma
Celeste

Diseases
None
Not Freeze Hardy

Pomegranates

Fig
Pomegranates

Culture
Best Grown as Bushes
Like Hot/Dry Summers
Self Fertile
Usually sold bare root
Prone to Sun Damage

Varieties
- Al-sirin-nar
- Russian 18
- Salavatski
- Spanish Sweet
- Surh ANor
- Wonderful

Insects/Diseases
Stink/Leaf Footed Bugs
Whiteflies and thrips.
Fungal Diseases

Pomegranates

Sun Scald
Sun Burn
Leaf Footed Bugs
Heart Rot
Fungal Disease

Citrus

Myer Lemon
Orange (Mandarin - Includes Satsumas
Clementines and Tangerines)

Satsuma grafted to sour orange
Pecan Culture

1-2 year old: Dia. 1.5 ft.
4-5 year old: Dia. 4-8 ft.
7-8 year old: Dia. 10-12 ft.
15-24 year old: Dia. 20 ft.

Soil pH for pecans

Upper Limit

8.0 9.0 10.0

Cotton Root Rot
Foliar Zinc
Iron Chlormosis
Zinc Deficiency

Nitrogen

Zinc is needed for leaf expansion
9 to 13 leaflets/support each pecan

Chlorophyll component needed for growth of branches, leaves, nuts.
- Pale foliage
- Poor shoot growth
- Reduced nut production

Soil Moisture & Root Growth

- Most feeder roots responsible for water uptake establish in the top 6-12” of soil.
- With good watering, roots will spread outward significantly from the trunk during the first two years.

What happens when water is limiting?

- Feeder roots die
- Growth is reduced
  - Caliper growth and terminal growth are correlated
- Water is redirected from fruit to leaves for cooling
- Leaves exhibit stress/scorch
- Twigs, branches, die
- Whole tree dies.
### Pecan Irrigation Requirements

- March to July  
  1 inch per week
- August to October  
  2 inches per week

### Dormant Season Irrigation

- Water about every 6 weeks
- Mid-November 2"
- End December 2"
- First February 2"
- **TOTAL 6"**

### Home Pecan Tree Fertilization

<table>
<thead>
<tr>
<th>Trunk diameter (inches)</th>
<th>Nut-Bearing Status**</th>
<th>Approximate Tree age (years)</th>
<th>Amount of granular fertilizer to apply using 10-10-10</th>
<th>Amount of granular fertilizer to apply using 21-0-0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2&quot;</td>
<td>Young, not bearing nuts</td>
<td>2-3</td>
<td>1.0 pound per inch</td>
<td>0.5 pound per inch</td>
</tr>
<tr>
<td>3-6&quot;</td>
<td>Young, not bearing nuts</td>
<td>4-7</td>
<td>2.0 pound per inch</td>
<td>1.0 pound per inch</td>
</tr>
<tr>
<td>7-11&quot;</td>
<td>Bearing normal crop</td>
<td>8-14</td>
<td>3.0 pounds per inch</td>
<td>1.5 pounds per inch</td>
</tr>
<tr>
<td>12-14&quot;</td>
<td>Bearing normal crop</td>
<td>11-18</td>
<td>4.0 pounds per inch</td>
<td>2.0 pounds per inch</td>
</tr>
<tr>
<td>15-19&quot;</td>
<td>Bearing normal crop</td>
<td>15-25</td>
<td>5.0 pounds per inch</td>
<td>2.5 pounds per inch</td>
</tr>
<tr>
<td>20-35&quot;</td>
<td>Bearing normal crop</td>
<td>25-30</td>
<td>7.0 pounds per inch</td>
<td>3.5 pounds per inch</td>
</tr>
<tr>
<td>Greater than 27&quot;</td>
<td>Bearing normal crop</td>
<td>30+</td>
<td>9.0 pounds per inch, maximum of 80 lbs per tree</td>
<td>4.5 pounds per inch, maximum of 40 lbs per tree</td>
</tr>
</tbody>
</table>

**Pecan is Alternate Bearing**

- Pecan varieties naturally overbear.
- Heavy seed crop production reduces carbohydrate/energy reserve production and flower production is reduced.
- Hormones that signal induction of female flowers are suppressed.
- Weather and pests accentuate the cycling.
Factors to consider in variety selection

- Pollination
- Suitability to Climate
- Marketing
- Precocity & Yield
- Alternate Bearing & Crop Load Mgt

Selecting the right mix of varieties is critical to both short-term and long-term economic success.
Central Texas Region

Type I pollen shed first
Flowers Receptive first
** New Untested
Ss Scab Susceptible
BB Breaks dormancy early

HOW MANY INSECTS FEED ON PECAN ???

** 20 NUT FEEDERS **
- Pecan nut casebearer
- Pecan weevil
- Hickory shuckworm
- Stink bugs/leaffooted bugs

** 103 Foliage Feeders **
- Black pecan aphid
- Yellow aphid complex
- Webworms
- Leaf miners
- Grasshoppers
- Walnut caterpillar

** 67 - Twig, Branch and root feeders **
- Twig girdler
- Root borers
- Branch pruners
- Scale

PECAN NUT CASEBEARER

Casebearer Moth
Pheromone Trap

Yellow Aphid Complex: 2 species
  - Yellow pecan aphid
  - Black margined aphid
Aphids (Black and Yellow)

Black Pecan Aphid causes yellow chlorotic spots and defoliation if pressure is heavy.

Late Nut Feeders: Hickory Shuckworm

PECAN WEEVIL

1. Monitor nut development
2. Use adult emergence traps
3. Use carbaryl (*Sevin 80S)
### Fruit & Nut Resources

#### Fruit and Nut Fact Sheets

- Apple
- Blackberry
- Blueberry
- Blackberry
- Kiwi
- Orange
- Papaya
- Pear
- Peaches
- Pomegranate
- Plum
- Raspberry
- Strawberry
- Tomato
- Tomato
- Tomato
- Tomato
- Tomato
- Tomato
- Tomato
- Tomato
- Tomato

#### Other Sources

- Texas Agricultural Experiment Station
- Texas A&M University
- Texas A&M AgriLife Extension
- Texas A&M AgriLife Research

#### Texas Fruit Growers Blog

- Texas High Tunnel Conference, October 6-7, 2015
- Texas Fruit Growers Conference, October 6-7, 2015

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http://aggie-horticulture.tamu.edu/fruit-nut