Growing Fruits in the Home Garden

Dr. Elena Garcia, PhD
Fruits in your Backyard

- Home Production
  - Small space
  - Perennial production
  - Some have few pests
  - Quality assurance
  - Landscape component
  - Home processing
  - Most have no special equipment needs
  - Health value
WHAT’S IN FRUITS?

NUTRIENTS
- VITAMINS
- MINERALS
- DIETARY FIBER

FRUITS = NUTRIENT DENSE

SECONDARY METABOLITES
- PHENOLICS
- NITROGEN COMPOUNDS
- CAROTENOIDs
General Characteristics

- Perennial - most are woody except for strawberries
- Variable growth habit – trees, vines, low-growing colonies, thickets or hedges, erect, semi erect shrubs
- Genetically heterozygous - not "true to type" from seed and are propagated asexually
- Small fruits usually grown on their own roots
- Trees and grapes are usually grafted
- Intensively managed
- High economic returns
Planting Considerations

- Site selection
  - Climate
  - Microclimate
  - Soils
- Crop (species) and cultivars to be grown
- General cultural considerations
- Pest management
Climatic Considerations

Temperature

- Cold injury
- High temperature stress
- Length of low temperatures "chilling"
- Fluctuating winter temperatures
Arkansas Hardiness Zones
Example: Catalogue Description

“Another apple developed to beat McIntosh, and it does. Ripens later, keeps better. Recommended by New York State Experimental Station - and justly so. Medium to large fruit, dark red over green background. A high quality, all purpose apple.

Ripens September.

Macoun apple

Zones 4-8
Winter Hardiness and High Temperature Stress

- Species
- Differences in cultivars
- Health of plant contributes to hardiness
- Avoidance measures – mulching
- Low temperatures can damage buds, shoot tips, canes, crowns, whole plants
- High temperatures affect fruit quality and color, next year’s flower bud initiation
“Chilling Requirements”

The amount of cold needed by a plant to resume normal spring growth following the winter period is commonly referred to as its "chilling requirement."

\[(\text{daily max} + \text{daily low}/2) - 45^0\]
# Chilling Requirements for Small Fruits

**TABLE 2-8** APPROXIMATE NUMBER OF CHILLING HOURS REQUIRED TO BREAK WINTER REST FOR VARIOUS TEMPERATE SMALL FRUIT CROPS BETWEEN 30 AND 45°F (0 AND 7°C)

<table>
<thead>
<tr>
<th>SMALL FRUIT</th>
<th>HOURS OF CHILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grapes <em>vinifera</em></td>
<td>100–400</td>
</tr>
<tr>
<td></td>
<td>1200–1500</td>
</tr>
<tr>
<td><em>labrusca</em></td>
<td></td>
</tr>
<tr>
<td>Strawberry</td>
<td>200–300</td>
</tr>
<tr>
<td>Blueberry</td>
<td></td>
</tr>
<tr>
<td>Rabbiteye</td>
<td>200–500</td>
</tr>
<tr>
<td>Highbush</td>
<td>650–850</td>
</tr>
<tr>
<td>Blackberry</td>
<td></td>
</tr>
<tr>
<td>Thorny</td>
<td>200–600</td>
</tr>
<tr>
<td>Thornless</td>
<td>700–1100</td>
</tr>
<tr>
<td>Raspberry</td>
<td>800–1700</td>
</tr>
<tr>
<td>Currant</td>
<td>800–1500</td>
</tr>
<tr>
<td>Gooseberry</td>
<td>800–1500</td>
</tr>
<tr>
<td>Kiwifruit</td>
<td>500–600</td>
</tr>
<tr>
<td>Cranberry</td>
<td>2000</td>
</tr>
</tbody>
</table>
Climatic considerations

Microclimate
- Elevation
- Slope
- Air Drainage
- Solar exposure
Climatic Considerations

Spring Frosts: Common in the South

- short duration
- result of inversion
- temperatures of 30° to 25° F commonly
- damage is due to tissues exposed to surrounding cold
FROST RISK EXAMPLES

Critical temperature - minimum temperature that buds, fruit or flowers will endure for short periods without injury.

- **HIGH RISK:** Strawberries - bloom early, flowers damaged below 30° F; peaches

- **MEDIUM RISK:** Grapes - shoots can be damaged at 27° F; apples

- **LOW RISK:** Highbush blueberries - bloom later, flowers hardy to 23 to 25° F
Avoidance and Protection Measures

- Site selection
- Species and cultivar
- Frost protection devices
- Ground cover management
- Cultural practices
Cultural Practices

Any practice that extends growth into the fall decreases hardiness

- **Nutrition**
  - Avoid late nitrogen fertilization

- **Pruning**
  - Pruning prior to low-temperature injury tends to increase injury

- **Have ‘healthy’ plants**: Photosynthesis
  - Reduce pest damage
Soil Considerations

Drainage is more important than fertility

- Dig a hole 8” wide by 3’ deep and fill with water
- Drains in 24 hours: all fruit crops can be grown
- Drains in 36 hours: apples, pears and pecans
- Drains in >48 hours: not suitable for fruit crops
Chances for Success: Limited
Planting Site

- **Slope**
  - A 4 to 8% slope is ideal.
  - A steeper than 10% slope may make it difficult to operate machinery.
  - Avoid areas at the bottom of the hill where cold air settles and frost pockets form.

![Diagram showing cold air settling and frost pockets forming on a steep slope.](image-url)
Soil Fertility and pH

- Soil tests are available from U of A, see your local agent
- **A MUST:** Correct any pH imbalance before planting
- Based on soil test, amend soil as needed
  - Generally, fruits crops do not respond to P applications after establishment
- Continue to monitor fertility through the planting’s formative years (years 1-3)
Nitrogen
Phosphorus
Potassium
Sulfur
Calcium
Magnesium
Iron
Manganese
Boron
Copper & Zinc

pH AFFECTS NUTRIENT AVAILABILITY

strongly acidic
pH 4.5
neutral
pH 7.0
strongly alkaline
pH 9.5
pH and Plant Growth

- Soils with a pH between 5 to 5.5: moderately acidic, but plants will grow
  - May develop nutritional problems
- Soils with a pH between 5.5 to 6.5: ideal for most plant growth
- Exception: blueberries - pH 4.5 to 5.0
Iron-deficient plants have chlorotic leaves with green veins. Symptoms develop first on the young leaves at the shoot tips.
Site selection

Soil conditions

- Ideal soil for fruits
  - slightly acidic
  - well drained
  - medium loam
Considerations: Exposure to Sunlight

- Most fruit plants require direct sunlight to achieve maximum fruit production
- Fruitfulness of buds is strongly influenced by the quantity of sunlight they receive
- Rapid drying of the plant canopy reduces the potential for disease
- Early morning sunshine is best for quickly drying plant canopies
Planting Site

Sun exposure
North-south row orientation
North facing slope- delayed bloom
Where is the blueberry bush?
<table>
<thead>
<tr>
<th>TOOL</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation</td>
<td>Effective&lt;br&gt;Non-selective&lt;br&gt;Equipment readily available&lt;br&gt;Considered “Green”</td>
<td>May damage soil structure&lt;br&gt;Spreads perennial weeds&lt;br&gt;May damage tree /roots&lt;br&gt;Short term control</td>
</tr>
<tr>
<td>Mulching</td>
<td>Effective&lt;br&gt;Non-selective&lt;br&gt;Holds moisture&lt;br&gt;Considered “Green”&lt;br&gt;Long-term control</td>
<td>Availability of mulch&lt;br&gt;Cost of mulch/application&lt;br&gt;Attractive to rodents&lt;br&gt;Must be free of seeds</td>
</tr>
<tr>
<td>Mowing</td>
<td>Rescue treatment&lt;br&gt;Quick suppression&lt;br&gt;Equipment available&lt;br&gt;Reduce seed spread</td>
<td>Weeds may still compete&lt;br&gt;Quick regrowth&lt;br&gt;Several mowing required&lt;br&gt;May damage young trees</td>
</tr>
<tr>
<td>Herbicides</td>
<td>Effective&lt;br&gt;Easy to apply&lt;br&gt;Can be selective&lt;br&gt;Timely</td>
<td>Requires at least 2% OM&lt;br&gt;Directed spray equipment&lt;br&gt;Effects on pest complex&lt;br&gt;Cost varies</td>
</tr>
</tbody>
</table>
Tree Fruits
Types of Fruit Trees

- Pomes: Apples, pears, quince
- Drupes or stone: Peaches, plums, cherries
To Do List

New Plants
  ▶ Ordering plants
  ▶ Soil Preparation
  ▶ Planting

Care of older plants
  ▶ Pruning and Training
  ▶ Irrigation
Nurseries

- Choose a nursery carefully.
- The investment you will be making when buying your plants needs to have very careful considerations.
- The plant quality you buy will have an impact on the life long productivity of the planting.
- Ask other people for suggestions on where to buy your plants.
- Remember, bargain or low priced plants may be more costly on the long run because they may be of poor quality.
Buying Trees

Keep the following points in mind when purchasing fruit trees:

- A healthy 1-year-old whip approximately 2- to 3-feet tall with $\frac{1}{2}$ inch diameter trunk and a good root system is preferred.
- A small tree with a good root system is more desirable than a large tree with a poor root system.
- If older trees are purchased, they should be cut back to force out buds lower on the main trunk.
- Do not purchase trees that appear stunted, poorly grown, diseased, dried, or to have suffered insect injury even at discount prices.
- Labels should be checked closely to make sure the selection is the desired variety and rootstock.
Fruit Trees: Cultivars and Rootstocks

- Most commercially sold fruit trees consist of two parts: They are grafted.
Cultivar and Rootstock

Why are most fruit trees grafted?

- Most are open pollinated
  - genetic variability
- To get certain characteristics
Selecting Cultivars

- Name
- Pest resistance
- Type: Spur, non-spur, fruit characteristics
- Climatic adaptability
- Pollination requirements
- Bloom period
- Days to harvest
Rootstocks

What to look for in a rootstock

- Overall tree size
  - standard
  - semidwarf
  - Dwarf

- Precocity

- Climatic adaptability

- Drought resistance

- Soil type adaptability

- Pest resistance
Apple Rootstocks

G.16
M. 9
M. 7
M. 26
G.30
MM. 106
M. 111
Seedling

8-9 ft
>15 ft
Pear Cultivars

- Most of the popular commercial varieties are very susceptible to fire blight. No pear variety is immune to fire blight, but some have considerable resistance.
What type of apple or (fruit) trees grow best in Arkansas backyards?

Apples and Pears

- Apples are often easier to manage
- Both apples and pears can be very susceptible to Fire blight
- More natural resistance in apples
Which Kind of Pear?

European vs. Asian
Asian Pears

- Crunchy (sandy)
- Usually roundish
European Varieties

- Bartlett 😞
- Comice
- Seckel
- d’Anjou
- Bosc

- Harvest when firmness of baseball turns into softball
Fire Bight
Problems with other fruit trees

- Peaches: Tendency to bloom early: spring frost damage
  - Bacterial spot

- Cherries: Sweet: tendency to split
  Sour: suitable for processing

Both loved by birds
Cedar apple rust

Orange, gelatinous telial horns grow from the galls on cedars or junipers in early spring.

Symptoms of cedar-apple rust on apple fruit.

Cedar-apple rust gall on juniper twig.

Cedar-apple rust leaf spot on upper surface of apple leaf.
What to do?

- Grow resistant or immune apples, crabapples, and junipers.
- When buying trees, check with the nursery about rust resistance.
- Destroy nearby, worthless or Eastern red cedar infected with rust galls.
- Where rusts are a problem, follow a recommended fungicide spray program.
Disease Resistant Apples

- William’s Pride
- King David
- Prima
- Pristine
- Enterprise
- Arkansas Black
Can I grow just one tree or do I need more than one for pollination?

- It depends on species and cultivar
- Check pollination charts in nursery catalogues
Pollination

When pollen from one plant is transferred to an unrelated tree of the same species

- Most fruit trees are not self-fertile
  - cross-pollination
- Cultivar bloom period should coincide
- Tetraploid apple cultivars such as Mutsu produce sterile pollen (compatibility)
- Honey bees are the primary pollinators
## Pollination Requirements

<table>
<thead>
<tr>
<th>Tree</th>
<th>Cross pollination required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>Yes</td>
</tr>
<tr>
<td>Pears</td>
<td>Yes</td>
</tr>
<tr>
<td>Peaches, nectarines</td>
<td>No</td>
</tr>
<tr>
<td>Plums- Japanese</td>
<td>Yes</td>
</tr>
<tr>
<td>Sweet Cherries</td>
<td>Yes (most)</td>
</tr>
<tr>
<td>Sour Cherries</td>
<td>No (most)</td>
</tr>
<tr>
<td>Pecan</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Apple Pollination Chart

<table>
<thead>
<tr>
<th>Pollen Source</th>
<th>Variety Pollinated</th>
<th>Early Bloom</th>
<th>Mid Season Bloom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey Mac</td>
<td>Jonathan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gravenstein</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idared</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pink Pearl</td>
<td>Akane</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Empire</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Williams Pride</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ash Mead's Kernal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Braeburn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cherry Cox</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cox's Orange Pippin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuji</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gala</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Granny Smith</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mutsu</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spitzenburg</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waltana</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Golden Delicious</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arkansas Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hauer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Newtown Pippin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tree Fruit Cultivar Recommendations for Arkansas

M. Elena Garcia
Associate Professor -
Fruits and Nuts

Curt R. Pom
Professor -
Tree Fruits, Fruit
Physiology, Culture and Management

The commercial success of a fruit orchard is highly dependent on the selection of cultivars that will perform reliably for the selected site and location and meet market demands. When selecting cultivars for your orchard, consider the following:

Climatic Adaptability of the Cultivars

The cultivars you select need to be adapted to the climatic conditions for your geographic location. Pay close attention to the information given by the nursery catalogs such as USDA winter hardiness zones and chilling requirements. Arkansas has five hardiness zones (6a-8a). If your orchard is located in a colder area of the state (USDA hardiness zones 6a or 6b), you need to select cultivars that are adapted to the colder winter temperatures. If you are in the southern part of the state, then you need to select fruit cultivars with lower chilling requirement hours.

Time of Bloom and Days to Harvest

You can select early, mid- and late-season cultivars to extend or concentrate the season to match your time constraints and specific market demands. However, care must be taken to make sure not to select cultivars that bloom too early, especially in crops such as peaches, where the danger of frost damage to the blooms can be a problem. For fruit that requires cross pollination, such as apples and pears, the time of bloom of the cultivar must coincide in order to have cross pollination among the cultivars.

Pest Resistance

Growing fruits requires high horticultural and pest management inputs. The first step to reduce the amount of time and effort is to buy cultivars that have low susceptibility to pests prevalent in your area.

For example, in Arkansas, bacterial spot is a serious disease that affects leaves, twigs and fruit of peaches and nectarines. The disease can prematurely defoliate a tree, causing weakness and eventually death if not treated. It is prevalent in areas with hot, humid climates. Peach cultivars bred in areas where the climate is not conducive to the development of bacterial spot are usually not tested for resistance to this disease. If you buy cultivars that have been developed in an area where this disease is not a problem, e.g., California, there is a high probability that the peach will be susceptible to this disease unless otherwise stated in the nursery catalog. Buying trees...
Proper planting

- When to plant?
  - Spring
    - If trees are bare-root
    - After danger of severe winter temperatures, before it gets too hot
  - Fall
    - If trees are in containers
Spacing

Tree spacing depends on:
- Species
- Rootstock
- Pollination
Proper planting

- Never let the roots dry out
  - Soak roots of bare-root trees 1-3 hrs before planting
- Hole should twice as large as the root system
- If putting any soil amendment, mix with soil that will be used to refill the hole
Proper planting

- Prune roots
- Apples: graft union should be 2”-3” above the soil line
- Peaches and pears: plant at same level as nursery
- Pack the soil gently, but firmly
- Stake dwarf trees
- Place mouse guard at base of tree
- Apples and pears: “Head back” to about 36” tall
Heading cut at planting

Apples and pears: Cut any limbs growing below 20 to 24”
Is all of the fertilizing and spraying we read about necessary to be successful

Yes!!!

No fertilizer application in the fall
Fruit Thinning

- Removing some of the developing fruit
  - To provide top quality, full-sized fruit
  - To ensure good return bloom the following year

- Time of thinning depends on the time of flower initiation according to the species

- Fruit removal needs to be done before the flowers buds for next year are initiated
Fruit Thinning

- How to thin
  - As early as possible after bloom
  - Cut off the young fruit by their stems
  - Leave the largest fruit
  - Fruit should be 4-6 inches apart

- Goal: Keep largest fruit (apple “king” fruit)

- June drop
Fruit Thinning

As a general rule for apples, 18 leaves are necessary for one apple to develop satisfactorily.

Peaches need to be spaced about 6 inches apart on the limb.
### Time of flower initiation of some deciduous fruits

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Initiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peach</td>
<td>Late May-late June</td>
</tr>
<tr>
<td>Apricot</td>
<td>Early July</td>
</tr>
<tr>
<td>Cherry (swt)</td>
<td>Early June</td>
</tr>
<tr>
<td>Cherry (sour)</td>
<td>Mid-June</td>
</tr>
<tr>
<td>Apple</td>
<td>Mid-May-mid-June</td>
</tr>
<tr>
<td>Pear</td>
<td>Early June–early July</td>
</tr>
</tbody>
</table>
June Drop - Peaches
Harvesting

- Apples and pears continue to ripen after harvested.
- Pears are best when left at room temperature before eaten.
- Peaches, nectarines, and plums do not continue to ripen.
  - They will soften.
### Approximate Harvest Seasons for Fruits in AR

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plum*</td>
<td>June – Late July</td>
</tr>
<tr>
<td>Peach</td>
<td>Mid-June – Mid-August</td>
</tr>
<tr>
<td>Apple</td>
<td>Late June – Late October</td>
</tr>
<tr>
<td>Pear</td>
<td>Mid-August – Mid-September</td>
</tr>
<tr>
<td>Pecan</td>
<td>October - November</td>
</tr>
</tbody>
</table>

*European-type plums in North Arkansas
Pruning and training

Balancing Act

Vegetative  Fruiting
Pruning and Training

- Goals for pruning and training include:
  - Producing a supporting framework for the tree
  - Allowing annual flower formation
  - Developing a tree which allows maximum fruit growth and quality development
  - Ease of management
  - Prune as late as possible in the dormant season
% of full radiation needed for various quality factors in apples

<table>
<thead>
<tr>
<th>Character</th>
<th>Satisfactory development</th>
<th>Unsatisfactory development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit size</td>
<td>&gt;50%</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>Red color</td>
<td>&gt;70%</td>
<td>&lt;40%</td>
</tr>
<tr>
<td>Spur development</td>
<td>&gt;30%</td>
<td>&lt;25%</td>
</tr>
</tbody>
</table>
Branch Spreading

- promotes strong crotch angles
- promotes early bearing
- reduces scaffold vigor

Figure 13. Spreading Branches to Obtain Desired Branch
Use spreaders or tie down branches
Where fruit is formed

- Apples, pears, cherries: spurs (three year old wood)
- Peaches, nectarines, plums: one year old wood
- Figs, grapes: current year wood
Peach

Pears and Apples
Spurs

Two year & older wood

One year old wood
Pruning

Heading back cuts

- Removal of a part of a shoot or branch
  - It removes terminal buds
  - Apical dominance is weakened or lost
    - Physiological effects

- Net result: increase in total shoot growth
Pruning
Heading back cuts
Pruning
Thinning cuts

- Removal of an entire shoot or branch at its junction with the trunk
- Ratio of terminal to lateral buds is not disturbed
  - Less physiological changes
- Net result: It does not increase shoot growth as much as heading cuts
Pruning

Thinning cuts
How to make the cut

Cut above ‘collar’
MODIFIED CENTRAL LEADER System (apples and pears)
Excessive upright growth occurs when the central leader is cut.
Peach Pruning
Peach Pruning, cont
Irrigation

- Under drought conditions, continue to water your trees
  - Roots continue to respire during the dormant season
  - Do not leave standing water over 24 hrs
Cultural Practices

Any practice that extends growth into the fall decreases hardiness

- Nutrition
  - Avoid late nitrogen fertilization

- Pruning
  - Pruning prior to low-temperature injury tends to increase injury

- Have ‘healthy’ plants: Photosynthesis
  - Reduce pest damage
Questions?
Thank You!