Horticultural Classifications Of Fruits

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Thanksgiving Point
• Fruits are classified according to the way the seeds and flesh are created from the flowers

• The major tree fruits in Utah fall into the following categories
Drupe

- A fruit derived from a single carpel, usually having a hard, stony endocarp and a fleshy pericarp
  - Apricot
  - Peach
  - Plum
  - Cherry
  - Almond
Nut

- A Fruit in Which the Carpel Wall Is Hard or Bony in Texture
  - Pecan
  - Walnut
Pome

- A fruit in which the true fruits (core sections) are surrounded by an enlarged fleshy floral tube or receptacle
  - Apples
  - Pear
  - Quince
Tree Growth And Development

• To understand why certain practices are done in fruit production, it is important to understand how fruit trees grow.
Growth Cycle Of Temperate Zone Tree Fruits
Growth Cycle Of Temperate Zone Tree Fruits

- The yearly cycles must be interrupted by a period of cold
- This is known as the rest period, or when the tree is dormant
- Different fruit trees require different lengths of dormancy
Growth Cycle Of Temperate Zone Tree Fruits

GROWTH CYCLE FROM SEED TO MATURE TREE

Germination

Mature Fruit Tree

Dormancy

Yearly Cycle is Cold Requiring

Seed Dormancy Broken by Cold

Stratify 60 days at 35 Degrees F

Flowering Following Spring

Fruiting
Blossom And Fruit Development

- More important than the growth cycle of the wood is the growth of the fruit buds.
- Formation of the fruit is dependent on the flower.
There Are Two Basic Types Of Flowers

- Pome fruits such as apples and pears
- Stone fruits such as peaches and cherries
Pome Fruits

- Stigma
- Anther
- Style
- Filament
- Nectary
- Receptacle
- Sepal
- Ovary
Stone Fruits

Longitudinal section of cherry flower

- Petal
- Anther
- Filament
- Stigma
- Style
- Ovary

The ovary matures after pollination to produce the fruits.
Pome Fruit Development

Two-Year Cycle

YEAR 1
Mature Fruit Tree in Spring
Fruit Initiation
Dormancy

YEAR 2
Dormancy
Floral Development
Fruit Development
Pome Fruit Development

- In an apple the true fruit is the core section.
- This contains five ovules in which the seeds are formed.
- The part we eat is an enlarged floral tube or receptacle.
Pome Fruit Development

- Many floral parts are visible in a cross section of a mature apple
- The following diagram is a longitudinal and cross section of an apple
The following diagram is a longitudinal and cross-section of an apple.
Stone Fruit Development
Stone Fruit Development

• In peaches and other stone fruits, development of the fruit is different
• The ovary matures after pollination to produce the fruits
• A single carpel matures with a strong endocarp, or pit
• This is surrounded by a fleshy Pericarp which is the fruit we eat
Stone Fruit Development

• The ovary matures after pollination to produce the fruits

• Longitudinal section of peach fruit
Fruiting Habit

Longitudinal section of peach fruit

- Remnant of Style & Stigma
- Flesh
- Stone
- Seed
- Skin
Common Fruit Buds And Locations

• Apple - terminal with some lateral, on spurs
• Pear - same as apples
• Peach - lateral, never terminal, on year-old wood
• Apricot - mainly on lateral spurs, also on year-old wood
Common Fruit Buds And Locations

- Sweet cherry - lateral, never terminal, on spurs and shoots
- Sour cherry - lateral, mostly on shoots, not as many on spurs as with sweet cherry
- Plum and cherry flower buds are borne laterally and the terminal bud is generally a leaf bud
Apples and Peaches

APPLE FRUITING WOOD

PEACH FRUITING WOOD
Apple

- Terminal with some lateral, on spurs
Pear

- Same as apples
Peach

- Lateral, never terminal, on year-old wood
Apricot

- Mainly on lateral spurs, also on year-old wood
Sweet Cherry

- Lateral, never terminal, on spurs and shoots
Sour Cherry

- Lateral, mostly on shoots, not as many on spurs as with sweet cherry
Flower buds are borne laterally and the terminal bud is generally a leaf bud.
Apples And Pears

• A terminal flower bud frequently forms so further elongation of the spur is forced out of a straight line.
• These differences in fruiting habits help determine the management of a tree
Apples

• Produced on spurs which need to be encouraged and developed
Peaches

- Borne on one year wood which requires constant renewal to keep an adequate area of prime fruit-producing wood.
Bud Differentiation

- Bud differentiation refers to the formation of flower or shoot parts in buds
- It usually occurs, during the summer, preceding bloom the following spring
Budding

• Apple - early June to early July
• Pear - late June to early July
• Peach - late July
• Apricot - early August
• Sweet cherry - late June to July
• Sour cherry - July
• Plums - late July to August
How a tree is treated under different conditions will influence whether a bud differentiates into a shoot or flower.
Factors Which Affect Flower Bud Formation

- Higher starch levels are correlated with initiation of flower buds
- Carbohydrate accumulation
Factors Responsible For High Starch Levels

- Adequate nutrients
- Good leaf surface
- High light intensity
- Proper moisture supply
- Nitrogen supply
  - Low nitrogen reduces tree metabolism so fewer carbohydrates are produced, though high nitrogen levels stimulate vegetative growth over fruit bud formation
Carbohydrate Accumulation

- Adequate foliage
- Each fruit requires a certain number of leaves to grow and mature it
- If there are not enough leaves it will affect carbohydrate status and fruit production
Biennial Bearing

• No fruit is borne on spurs which bore fruit during the past season
Excessive Pruning

- This causes invigoration and more vegetative growth
Other Reasons Why A Tree May Fail To Produce Fruit:

- Winter injury to dormant flower buds
- Insects feeding on the pollen of developing fruit
- Frost Damage to Flowers
- Low Vigor of Trees Whether Because of Overbearing or Because of Defoliation by Insects or Disease
Other Reasons Why A Tree May Fail To Produce Fruit:

• Unfavorable weather which prevents bee activity during the period of flower receptivity
• Temperatures too low for pollen-tube growth
• Poor pollen distribution or insufficient cross-pollination
• Certain fungicide sprays, which applied during bloom, may destroy pollen
Scoring
Scoring

• Proper scoring before bud initiation can promote fruiting the next year
Scoring

- Scoring is a small (blade width) cut around the tree that injures the cambial tissue,
- This keeps carbohydrates near the spurs, by blocking it from moving into the roots.
Pollination

• The transfer of pollen from the anther to the stigma

• The transfer of pollen from the anther to the stigma on the same tree is self pollination

• The transfer of pollen from the anther of one variety to the stigma of another is cross pollination.
Pollination

• Some kinds of fruit fail to set a crop unless the flowers are pollinated and fertilized by pollen from another variety
• Such varieties are self-unfruitful
Pollination

- Varieties which set fruit with their own pollen are said to be self-fruitful.
Pollination

- Honeybees and bumblebees transfer pollen in deciduous fruit trees
- Pollen is seldom transferred by any other means
Pollination

- The importance of these insects cannot be overemphasized
- They should be encouraged and protected
- Spraying with insecticide during bloom is not recommended
Pollination

- Bees do not fly when temperatures are below 40 degrees F, when winds are present, or when rain occurs.
- Eliminate dandelions and other blooming weeds as they attract bees away from fruit blossoms.
Pollination - Apples

- No apple variety is sufficiently self-fruitful
- A few varieties produce no viable pollen
- These varieties are not only self-unfruitful, but will not pollinate other varieties
- When one of these is planted, plant two other varieties that produce good pollen
Pollination - Apples

- Red sports of Delicious, McIntosh, Jonathan, Northern Spy, and Rome are incompatible with the parent variety.
- If two or more sports of the same variety are planted, a good pollinator should be included in the planting.
Pollination - Pears

- Pears require cross pollination
- Bartlett is the most popular canning variety. Bartlett and Seckel are cross-incompatible
- Bosc, Comice, and Anjou are favored as cross pollinators for Bartlett
- Asian pears can also be used for pollination
Pollination – Sweet Cherries

• Cherries are generally self-unfruitful. Cross-incompatibility exists among the Bing, Emperor Francis, Lambert, and Royal Ann varieties

• Black Tartarian, Schmidt, Stella, Windsor, and Van are effective pollinators of commonly grown varieties
Pollination - Sweet Cherries

• Stella is a dark-fruited cherry variety. It has the distinction of being self-fruitful so may be successfully planted alone and still produce a crop.
Pollination – Tart Cherries

• All varieties of tart cherries commonly grown are self-fruitful. Full crops can be expected from planting one variety.

• Montmorency is the most popular tart cherry.
Pollination - Plums

• Plums vary in their requirements for cross-pollination, depending upon both species and variety
Pollination - Plums

- At least two varieties should be included in a planting
- A few varieties, including Stanley and Monarch, are self-fruitful, but set better crops when another variety is included
Pollination - Plums

- Albion
- Archduke
- Bradshaw
- Brooks
- Diamond
- Grand Duke
- Hall
- Imperial Epineuse
- Italian Pond

- President Tragedy
- Others

- Consistently Self-unfruitful pollinizers for European Varieties
- Chose Other Varieties From This Group.
Pollination - Plums

• **Most Japanese varieties are self unfruitful**
  – *Santa Rosa*
  – *Satsuma*
  – *Elephant heart*
  – *Burbank*
  – *Abundance, are self-unfruitful but are dependable Pollinizers for each other*

• **European varieties are unsatisfactory as pollinizers for Japanese varieties**
Pollination - Plums

• The two most common varieties of this species, are self-fruitful and will produce good crops without cross pollination
  – Shropshire
  – French Damson
Pollination - Peaches

- Most Peaches and Nectarines Are Self-fruitful and Do Not Require Pollination
Pollination - Peaches

• **Exceptions are:**
  - J.H. Hale
  - Stark Halberta
  - Stark Honeydew Hale which require pollination

• **Other peaches will pollinate J.H. Hale unless they bloom too early**
Quince

- All varieties are sufficiently self-fruitful.
Apricots

- Self-fruitful except for perfection which requires a pollinizer.
Fertilization

- Nitrogen fertilizer is the one most required in Utah
- Observing the shoot growth is the best way to manage tree nutrition
Fertilization

• In early winter look at the shoot growth of the past season

• The previous year's shoots are usually a more intense color than older wood
Fertilization

- Measure the length of the year's shoots on several branches and determine the average length.
## Average Length of Shoot Growth for Healthy Trees

<table>
<thead>
<tr>
<th>Fruit Tree</th>
<th>Average Shoot Growth in Inches</th>
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<tbody>
<tr>
<td></td>
<td>&lt; 6 Years Old</td>
<td>&gt; 6 Years Old</td>
<td></td>
</tr>
<tr>
<td><strong>Apple – Dwarf and Semi-Dwarf</strong></td>
<td>10-20</td>
<td>4-8</td>
<td></td>
</tr>
<tr>
<td><strong>Apple – Standard and Spur Types</strong></td>
<td>10-20</td>
<td>6-10</td>
<td></td>
</tr>
<tr>
<td><strong>Peach Nectarine and Apricot</strong></td>
<td>10-24</td>
<td>8-15</td>
<td></td>
</tr>
<tr>
<td><strong>Sour Cherry and Plum</strong></td>
<td>10-20</td>
<td>8-12</td>
<td></td>
</tr>
</tbody>
</table>
Fertilization

• Increase the fertilization rate if shoot growth is below average, and decrease the rate if growth is above average
Fertilization

- Pears frequently do best without fertilizer because of the damage of fire blight disease which attacks young, vigorous growth
Fertilization

• Apply the nitrogen to the soil in a band below the outer edge of the branches

• For young trees the width of the fertilizer band may be up to two feet near the tree trunk

• For mature trees, the band may be two to three feet wide and eight to ten feet away from the tree trunk
Fertilization

• Nitrogen fertilizer may be spread on the soil (or snow) anytime from December until early March
Fertilization

• It takes several hundred pounds of barnyard manure or other organic fertilizers to supply enough nutrients for adequate tree growth.
Fertilization

- Iron chlorosis is not caused by the lack of iron in the soil, but the iron is not available because of alkaline soil.
- It is greatly aggravated by overwatering especially in the early spring.
Iron Chlorosis
• The best control of iron chlorosis for fruit trees growing in alkaline soils is a chelated iron compound sold as Sequestrene 138 or Ferriplus Iron
Frost And Frost Protection

- Spring frosts limit fruit production more than any other factor
- Little can be done to control the frosts
Frost And Frost Protection

• The home orchardist can provide only a limited amount of protection against freezes that can damage buds, blossoms, and small fruit
Frost And Frost Protection

- Covering
  - Blankets or quilts can insulate small trees from some frosts
  - They trap heat rising from the soil and maintain a few degrees of protection
  - Covering with one layer of plastic does little or no good unless a heat source is placed beneath it. Electric bulbs may help if just a light frost is expected.
Sprinkling

- Considerable freeze protection can come with application of water
- Most sprinklers apply too much water to the trees and can damage the limbs and branches
- Sprinkling is not recommended for homeowners.
Hardiness Ranking

- Apples
- Pears
- European Plums
- Sweet Cherries
- Peaches
- Nectarines
- Japanese Plums
- Sour cherries

- Most Hardy
- Least Hardy
When To Prune

• Light pruning may be done any time of the year, but heavy pruning should be done in late winter or early spring

• Pruning before this time increases danger of cold injury
Size Control

- Trees can vary in size by variety, type of growth habit or by the variations in rootstock or interstem.
- Variety size refers to the mature plant size. For example, Red Delicious trees are usually larger than Rome beauty, all other growth factors being equal.
Size Control

- Spur type apple trees develop long limbs with few side branches but many fruiting spurs.
- These trees are more open than standard trees and grow to about three-fourths of the size of a standard tree.
Size Control

• Many cultural factors help determine ultimate tree size including soil type and fertility, soil moisture, pruning and training, and fruit production during early growth
Size Control

- The characteristic of this tree is the shorter Internode length between buds which results in many more fruiting spurs per limb than a non-spur tree spur varieties may ripen later than standard varieties.

- They are not available for all varieties.
Size Control

- Dwarfing rootstocks are clonal which impacts the dwarfing tendency to the variety
- A number of rootstocks provide a wide range of dwarfing
Size Control

- Rootstocks and interstocks are other ways of producing size-controlled trees.
Size Control

- Interstems are a graft between the rootstock and scion wood of the tree
- The advantages of this type of tree are that the correct rootstock can be selected for soil conditions and anchorage without sacrificing dwarfing
- Interstems are not very common.
Apples

- Standard apple trees are produced by planting seeds, growing the seedlings for two years, and grafting on the desired variety.

- Dwarfing rootstocks must be propagated vegetatively by rooting the shoots of specific rootstocks in stoolbeds.
Apples

- The east Malling research station in East Malling, Kent, England, played a leading role in selecting dwarfing rootstocks from wild, small-growing apple species.
- Therefore, most of the common dwarfing rootstocks carry the designation M (Malling) and a number.
Pears

- Pears may be satisfactorily dwarfed by grafting the variety scion on Quince A rootstock
- Although most trees available to the home orchardist will be that combination, Old Home X Farmingdale rootstock will be satisfactory and may be found in nurseries
Stone Fruits

• Dwarf cherries, peaches, and plums are available
• Various seedling and clonally propagated rootstocks are used to produce the dwarfing effect
• The degree of dwarfing varies widely
• Stone fruit dwarfing is not as satisfactory as in apples and pears, and compatibility problems between stock and scion may produce a short lived tree.
Winter Injury

- There are several categories of winter injury.
  - Blackheart
  - crotch and trunk injury
  - crown and collar injury
  - winter sunscald
  - trunk splitting
  - dieback of twigs and young branches.
Blackheart

- The pith is usually killed and the heartwood is darkened, turning a shiny brown while the cambium and bark remain alive.
- With blackheart, the tree usually continues to grow and may form new sapwood and bark.
- Blackheart is found in apples, peaches, plums, pears, and cherries following severe winters.
Crotch Injury

- The bark, cambium, and sapwood in the crotches or forks may be killed when other portions of the tree are uninjured.
- Bark splitting may occur.
- Injury may extend several feet up the limb from the crotch.
Winter Sunscald

- Sunscald on limbs may be caused by excessive heat from direct sun rays.
- A similar injury may develop in winter on the southwest sides of tree trunks.
- Painting the exposed trunk with exterior latex paint is a good control measure for about two years.
- Tree trunk protectors or summer shades will also control the problem.
Crown Or Collar Injury

- Refers to a winter killing of the bark at or near the ground surface.
- Applying the white paint completely to the soil line may reduce this injury.
Splitting Of The Trunk

• Longitudinal splits in the trunk, often to the pith, may occur in extremely cold weather.

• The cracks usually draw together when the temperature rises, and the bark calluses over.

• Cracks are quite common on sweet cherry trees.
Die Back Of Young Branches And Twigs

- In a severe winter, this is common with many kinds of fruit trees.
- The injury occurs frequently on young, vigorous trees and seems to be an inherent characteristic with certain tender varieties.
Injury To Leaf And Flower Buds

- The leaf and flower buds of fruit trees can be damaged or killed by extreme low temperatures.
- Flower buds of some varieties of apples will withstand -31 degrees F to -40 degrees F.
- Peaches and some stone fruits are damaged at about 5 degrees F.
Killing Of Roots

- Roots are not as hardy as parts of the tree above ground.
- Roots of the apple may be killed at temperatures ranging from 10 to 25 degrees F.
- A very sudden drop in temperature after a warm winter day rarely kills roots, but a long, continued cold period when the ground freezes may cause root injury.
Killing Of Roots

• A heavy blanket of snow, a heavy mulch, or a good cover crop during the winter tends to protect the roots.
Irrigation

- Proper irrigation is a critical part of producing high quality fruit
- Irrigation water should not be applied just near the base of the tree
Irrigation

- Under favorable growing conditions, tree roots will extend ten to fifteen feet into the soil and spread out fifteen to twenty feet from the trunk in all directions.
- Young trees should have a doughnut-shaped basin around them so water will not collect around their trunks.
Irrigation

- Tree fruits prefer 3 to 6 feet of bare soil around their base. Trees should be watered deeply every 14 to 21 days.
- Trees in lawn areas often suffer from crown and root rots because of shallow, frequent irrigation.
Thinning

- Peach, apricot and apple trees often set more fruit than they can mature to a desirable size
- Thinning allows for an increase in size of the remaining fruit on the tree and improves fruit color and quality
Thinning

- Thinning induces regular annual bearing in certain apple varieties
- Thinning fruits also permits more thorough spraying for effective disease and insect control.
Apples And Pears

- Apples should be thinned as soon as possible after the fruit has set.
- If full benefits are to be obtained, first thinning should be completed within 20 to 25 days after full bloom.
- Some spurs should have all developing fruit removed to encourage return bloom.
- If too many fruit survive the June drop, thin again.
Apples And Pears

• About 6 to 10 inches between fruits is recommended

• With varieties of delicious apples, where greater size of individual fruits is important, the greater spacing is preferred

• The center apple of a cluster is usually the largest and the best apple to leave
Peach thinning should be done regularly and vigorously.

The sooner peach trees are thinned after bloom the larger the fruit will be at harvest.

Final fruit size will not be increased if thinning is done after pits begin to harden.
Peaches

- Peach tree thinning can be done by hand
- Removal of the smaller fruits encourages continued enlargement of big fruit
- Leave one fruit for every six inches of branch
Apricots

- Thin apricots in a similar manner to peaches
- Leave one fruit for every three inches of branch.
Plums

- Thinning plums is usually limited to the large Japanese varieties.
- The primary concern here is to facilitate insect and disease control.
- Plums are usually thinned by hand to about four inches apart.
Harvesting

• Home grown fruits and nuts should be harvested and used at just the right time, "the peak of perfection," direct from the orchard or garden
Apples

- Apples should be harvested when the fruit is fully colored for the variety
- A few sound (not wormy or damaged) fruit will begin to drop from the tree
- The seeds will have a dark brown coat
- With apples which are not red, the ground color should show a considerable yellowing
Apples

- Tasting is also a good indicator of maturity
- When harvesting an apple, carefully separate the fruit from the spur
- The spur is productive over many years, so don't tear the spurs from the tree
Pears

• Pears will not ripen properly on the trees
• If they turn yellow on the tree, the center will be brown and soft and have a gritty texture to the flesh
• Pears should just begin to turn from a dark green color to a light yellowish green
Pears

• Dark brown seeds indicate maturity
• The flesh should give a little if squeezed
• A few sound fruit drop from the tree
• Stems should separate easily from the spur with an upward twist of the fruit
• At 70 degrees F, summer pears will ripen in a few days off the tree
Peaches

- Watch for the ground color, not the amount of red
- It should be yellow and have lost its green color
- The flesh should give somewhat under pressure when squeezed. The fruit should separate easily from the tree with a slight twisting motion.
Plums

- With Japanese and European type of plums, the taste test is probably the best way to determine maturity
- They should just begin to soften and be sweet and juicy
Apricots

- Apricots must be completely yellow over the entire surface of the fruit but not too soft.
- They should be picked while slightly firm.
Cherries

- Cherries should ripen fully on the tree
- They must be juicy and sweet but still firm
- Don't break off the spurs when you pick cherries because that is where the blooms will form for next year's harvest
Almonds

- Harvest in the fall by knocking or shaking them from the trees
- Moisten the outer husks if they do not open easily, and crack open the softer, inner shells
- Dry the kernels out of the sun in a well-ventilated, dry place
Hazelnuts (Filberts)

- Once ripe nuts have fallen to the ground, gather them up every day so that they will not be harvested by squirrels.
- Dry by putting in mesh bags and hang by the furnace.
- They will also dry if you put a few layers in a cardboard box at room temperature.
- When dry, they will crunch when bitten.
Walnuts

- Walnuts will fall to the ground as they ripen.
- When they fall, they should be gathered and husked promptly, then spread thinly in a shady place to dry.
- English walnuts require faster drying than blacks so they won't mildew.
Walnuts

- Mesh bags hung by the furnace work well.
- Drying temperatures shouldn't exceed 100 degrees F.
- They are dry enough when the membrane between the halves breaks when it is bent.
- The husks of English walnuts fall free from the nuts when they ripen.
Producing Tree Fruits And Nuts In The Home Garden

• Quality fruit may be produced in the home garden in Utah

• It is important for you to know that the process is not always easy nor is it without expense or problems
Producing Tree Fruits And Nuts In The Home Garden

• Fruit trees need careful attention to soil and water management, pruning, and insect and disease control to produce good crops

• Poorly cared for trees serve as a source of disease and insect problems for other homeowners as well as commercial orchards
Site Selection

- Ideally, trees should be planted in deep, rich soil with good water and air drainage.
- Fruit can be grown on a wide variety of soil types.
Site Selection

- Poor soil can be improved by fertilization and cultural practices. However, extremely heavy or poorly drained soils should be avoided if possible.
- Trees should be located where they will get full sun. Trees should not be planted in lawns or areas where they receive excessive water.
Buying Trees

- Obtain the best nursery stock available.
- Buy only from reputable nurserymen who guarantee their plants to be true to name, of high quality, and packed and shipped correctly.
- Beware of "basement bargains".
- High prices do not necessarily mean high quality, but good, well-grown trees are not cheap.
Buying Trees

• One-year-old trees are usually preferred
• A common mistake is to select oversized or ready-to-bear nursery trees
• Younger trees bear almost as soon, are easier to keep alive, and develop into more healthy, vigorous trees than do the oversized stock
• The older trees cost nurserymen more to grow so must be sold for a higher price
Pruning

• General pruning rules
• When to prune
• Corrective pruning
Training The Home Orchard

- Modified leader
- Open center
- Developing good angles and strong crotches
- Espalier
Soil Preparation

- Important to the success of any home orchard planting. The ground should be spaded, tilled, or plowed 10 to 12 inches deep
- Organic matter may be worked in
- Improve your soil rather than haul in soil
- Any soil amendment should be mixed thoroughly with the soil
Deciduous Fruits Are Grown Throughout Utah

• The limiting factor in Utah for fruit production is the climate
• The major tree fruits include apples, pears, plums, peaches, apricots, and cherries
• While botanical characteristics differ somewhat with these fruits, their care and maintenance have many similarities