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Growing Fruit for Home Use

John Avery, Patrick Byers, Martin Kaps,
Laszlo Kovacs, and Marilyn Odneal
Edited by Marilyn Odneal



State Fruit Experiment Station
Missouri State University
Mountain Grove



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INTRODUCTION

Why Grow Fruit?

Having fresh, home grown fruit on the table is an enticing idea that prompts many people to consider growing fruit for their own use. Creating a beautiful "edible" landscape is also a worthwhile goal. Growing fruit can be a rewarding hobby if it is understood that a certain amount of work and dedication are required.

In general, home grown fruit harvested at the peak of quality is much better than fruit harvested at a distant growing area and shipped hundreds of miles before sale. A limited group of fruit cultivars dominates the produce section at the supermarket. The apple lover can usually purchase only 5 or 6 cultivars (good though they may be) at the grocery store but is missing out on the unique flavors of hundreds of other cultivars. If you want to enjoy the "out of the ordinary", grow it yourself!

While it is difficult to calculate the monetary value of fruit produced at home, some savings over the price at the grocery store can be expected. This is especially true if excess fruit is canned, frozen, or dried.

Fruits and vegetables are an important part of a healthy diet. Fruit is a good, low calorie source of vitamins, minerals, and carbohydrates. In addition, research suggests that certain fruits contain materials that may have additional health benefits. The home fruit grower is "harvesting health".

Finally, for many people fruit growing has value beyond the value of the harvested product. A home fruit garden can be a restful and relaxing place to "unwind" after a hectic day at the office. Home fruit production is as good for the soul as for the body.

Selecting a Fruit Crop

Missouri fruit growers are fortunate that many fruit crops are adapted to the state. One type or another of fresh fruit can be harvested from mid-May to October (see Figure 1). However, if you have no experience growing fruit crops, it is a good idea to start small with 1 or 2 fruits that are relatively easy to grow and that you and your family enjoy. Home fruit production is not a matter of simply planting a crop and waiting for bountiful harvests. Proper planning and care are required at all stages. By starting small, you can see if growing fruit is your cup of tea without a large investment of time and money.

Even though a fruit crop may be adapted to Missouri's climate, occasionally extreme conditions can reduce or eliminate a crop or kill plants. Cold injury is common and can result from sudden freezes in the fall, midwinter cold, and spring frosts. Plants that are not winter hardy throughout Missouri and do better in the southern part of the state include peaches, nectarines, Japanese plums, most blackberries, most French-American hybrid grapes, and most seedless table grapes. Plants that are damaged by late frosts during blossom are peaches and, to a lesser extent, strawberries. Sweet cherries and apricots very seldom escape spring frost injury and are not recommended for that reason. Fruits that generally survive both the winter cold and spring frosts include apples, pears, sour cherries, European-type plums, American and French-American hybrid grapes, strawberries (with winter mulch), blueberries, and raspberries.

Fruits such as European (vinifera) and muscadine grapes, citrus, and figs are not hardy in Missouri without special protection during the winter.

In addition to climate extremes, insects, diseases, and weeds can reduce the amount of fruit harvested by the home fruit producer. At least one pest attacks each of the fruit crops adapted to Missouri. Certain fruit crops, however, are much easier to manage than others. In some cases, disease resistant cultivars of fruit crops are available (see cultivar descriptions), and these cultivars should be given consideration.

In the overall picture, crops considered relatively easy to grow in Missouri with proper care include apples, grapes, some blackberries, and strawberries. Plants that are difficult to establish include peaches, other stone fruits, and highbush blueberries. Raspberries are more difficult to grow on shallow Ozark soils. Pears are limited by the disease fire blight. Currants and gooseberries are better adapted to the northern part of the state, but can be grown in the south if they are mulched and afforded partial shade.

Once a crop is chosen, the next step is to choose among the many cultivars available. Whenever possible consider disease resistant cultivars. Some cultivars are better adapted to Missouri's climate than other cultivars. Check with state organizations such as the SMSU Fruit Experiment Station for recommended cultivars for Missouri. The experience of other fruit growers in your area is also valuable in selecting adapted cultivars. The following sections of this publication include lists of adapted cultivars. Season of harvest is another consideration. By selecting several cultivars that ripen at different times the home fruit grower can have fresh fruit for a longer period. Use of the crop is also important. Certain cultivars lend themselves to eating fresh, while others are excellent for processing.

What size should the home fruit planting be?

The size of the home fruit planting is primarily limited by two factors, the space available and the amount of time and energy that the home fruit producer is willing to devote to the planting. The planting should never be greater than the grower can properly care for. Poorly maintained fruit plantings become eyesores and sources of problems for neighboring fruit plantings. In most cases the planting should be large enough to provide fruit for the family, with some left over to give away. Equipment, labor and time become a problem if the planting becomes too large. Table 1 will be helpful in planning the size of the home fruit planting.

Selecting a Site

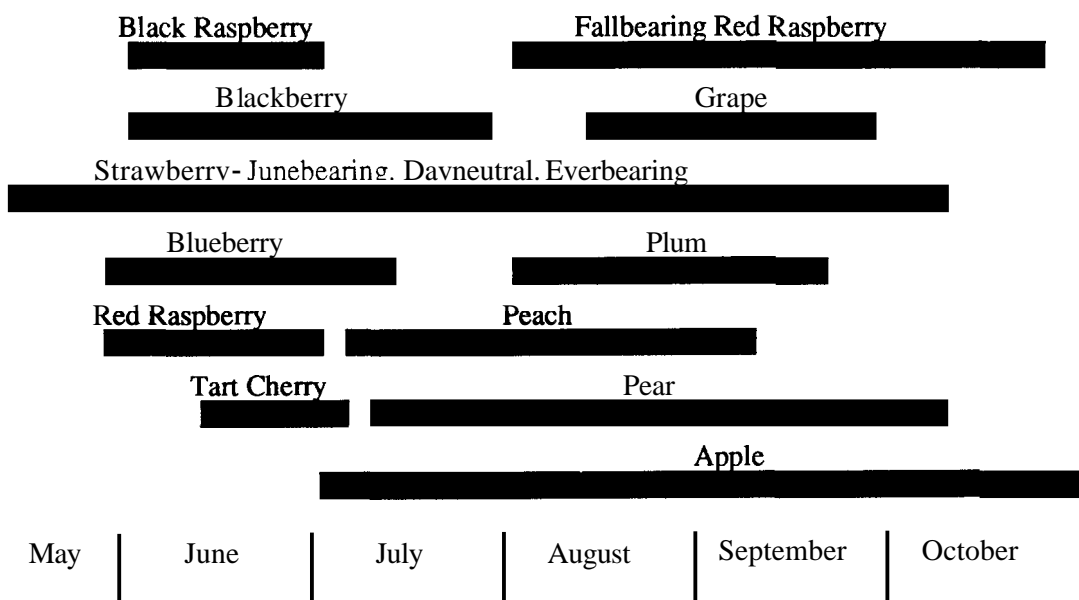
Urban home fruit growers often do not have the space for a fruit garden as such. However, fruit plants can be part of an attractive landscape. Such "edible landscaping" might include hedges of dwarf apples, brambles, grapes, and blueberries. Individual fruit trees can furnish beauty and shade as well as fruit. Grapes can cover an arbor, and strawberries make attractive borders and ground covers. Even apartment dwellers can grow strawberries and blueberries in containers.

If a choice of sites is available, several points should be considered. Once the orchard is planted, mistakes cannot be corrected later. The site should be close to the house and a source of water. Most fruit plants require full sun. Adequate air drainage is important for all fruit crops, but especially for crops sensitive to spring frosts and cold injury, such as peaches and other stone fruits, winter tender grapes, blackberries, and strawberries. To insure adequate air drainage, plant

Table 1. Bearing age, planting longevity, and estimated annual yield of fruit crops in Missouri.

| Fruit Crop | Interval from planting to fruiting (years) | Life of plants (years) | Estimated annual yield per plant or row |
|-----------------------------|--|------------------------|---|
| Apple (standard) | 4-6 | 35-45 | 10-15 bu/tree |
| Apple (semidwarf) | 3-5 | 20-30 | 6-10 bu/tree |
| Apple (dwarf) | 2-4 | 15-20 | 3-6 bu/tree |
| Pear | 5-8 | 35-45 | 10-15 bu/tree |
| Peach | 2-4 | 15-20 | 3-6 bu/tree |
| Plum | 4-6 | 15-20 | 3-5 bu/tree |
| Tart Cherry | 3-5 | 15-20 | 60-80 qt/tree |
| Grape | 3 | 20-30 | 10-12 lb/vine |
| Strawberry (June bearing) | 1 | 4-5 | 50-100 qt/100 ft row |
| Strawberry (everbearing) | 3-4 months | 2 | 50 qt/100 plants |
| Strawberry (dayneutral) | 2-3 months | 2 | 45-90 qt/100 plants |
| Raspberry (fallbearing red) | 5-6 months | 5-12 | 100-150 pt/100 ft row |
| Raspberry (summer red) | 1 | 5-12 | 150 pt/100 ft row |
| Raspberry (black) | 1 | 5-12 | 1 qt |
| Raspberry (purple) | 1 | 5-12 | 1 1/2 qt |
| Blackberry (erect) | 1 | 5-12 | 40 qt/100 ft row |
| Blackberry (semi-erect) | 1 | 8-10 | 4-10 qt/plant |
| Blueberry | 2-3 | 20-30 | 4-8 qt/plant |
| Gooseberry | 2 | 10-20 | 5-10 qt/plant |
| Currant | 2 | 10-20 | 3-4 qt/plant |

Figure 1. Ripening seasons for fruit crops adapted to Missouri.



on high ground. Cold air is heavier than warm air and settles in low areas or in front of obstacles that obstruct downward flow, such as wooded areas. Adequate water drainage is also necessary for proper growth of fruit plants. Avoid planting in an area that has standing water during the season. In order to observe the internal water drainage, dig a hole a foot or so deep in the questionable area. After you fill the hole with water, note the amount of time it takes for the water to drain down. If 4 to 6 or more inches of water remain in the hole after 24 hours, a drainage problem is indicated. Do not run this test if the soil is very dry. If a poorly drained area must be selected, one option is to plant on raised beds or berms. Be prepared to irrigate the raised plantings more frequently in the summer than you would a level planting. Adequate water drainage is important for all fruit crops, but it is critical for blueberries, peaches and other stone fruits, raspberries, and strawberries.

The soil characteristics of the potential site are also important. Most fruit crops do best in a slightly acid, well drained, moderately fertile loam soil. Good fruit soils should be at least 2 feet in depth before reaching bedrock or fragipan (a hard soil layer that roots cannot penetrate). Fruit crops also benefit from organic matter. **Soil samples from all prospective fruit sites should be tested by University Extension.** A soil test will give you information concerning the nutrients available in your soil, the pH (acid or alkaline), the percent organic matter in your soil, and the texture of your soil (clay, silt, loam, and so on). To learn the procedure for taking a proper soil test, refer to UMC Agricultural Guides GO 9109 and GO 9110 (see **FOR MORE INFORMATION** section on page 45). Bring a soil sample to your local University Extension office, request a horticultural soil test form, and check the computer category for vegetable

and annual flower garden. The vegetable and flower category will give you computerized fertilizer and lime recommendations suitable for most fruit crops (with the exception of blueberries).

Preparing a Site for Home Fruit Production

Site preparation is an important part of home fruit production. Fruit plantings are long-term investments in money and effort. Everything the home fruit grower can do to properly prepare the site for fruit production will pay off dividends in plant health, productivity, and longevity of the planting.

Site preparation should begin in the year before planting. In spring mark off the rows in the prospective planting. Eliminate all troublesome perennial weeds such as bermudagrass, johnsongrass, wild brambles, or multiflora roses. The nonselective systemic herbicide glyphosate (Roundup) can be used. Once the herbicide has taken effect, till up the planting area. Apply fertilizers as directed by the soil test results. Now is also the time to apply lime or sulfur to modify the soil pH, as directed by the soil test results. Finally, plant a warm season cover crop such as Sudan grass, soybeans, or buckwheat in tilled areas. In the fall the warm season cover crop can be tilled under. Collect a second soil sample to check on nutrient levels and pH. Organic materials can be added at this time, and cool season cover crops (annual ryegrass, oats, or wheat) can be planted to provide cover over the winter. In the spring, the cool season cover crop should be tilled under before you begin to plant. Construct berms or raised beds, and make final preparations for planting.

A few words should be said about the importance of organic matter. Organic matter added to the soil improves the

soil's ability to hold both water and nutrients. Organic matter can "lighten" a heavy soil and can add "substance" to a sandy soil. Organic matter may be added to the soil in the form of animal or plant residues. If fresh manures or residues are used, put them on the field at least 6 months before planting. Fresh manure or materials that have not been composted often contain weed seeds; therefore, composted materials are preferred. Green manure crops are those that are sown, grown, and then plowed under. Suggested green manure crops include sudex (green graze) and buckwheat (both planted in mid to late spring), and oats and annual rye (both planted in late summer or early fall). Organic materials that can be spread out on the field and later plowed under include stable manures, sawdust, wood chips, shredded leaves, and lawn clippings. Commercial fertilizer may be added to the field before planting a green manure crop or after working non-decomposed materials into the soil (about 10 pounds 13-13-13 or 3 to 4 pounds ammonium nitrate 33-0-0 per 1,000 square feet).

Ordering and Handling Nursery Stock

An important aspect of the success of home fruit production is the nursery stock. All nursery stock should be purchased from a reputable nursery. Reputable nurseries guarantee that fruit plants are true to name, well grown, free from insects and diseases, and packed and shipped correctly. While price is a factor, the primary concern in purchasing nursery stock is to obtain the best plants possible. If there is a problem, a reputable nursery will offer replacements, often at no charge.

Local nurseries may have a limited number of different cultivars available; the widest choice of cultivars

is available from mail-order nurseries. Nurseries are even available that specialize in a single fruit crop. Bare root nursery stock is often available from mail-order nurseries. Container-grown stock is more often found locally.

The form of plant available from a nursery varies with the fruit crop. Tree fruits are usually available as grafted or budded plants, consisting of a rootstock and a scion (the cultivar) joined at the graft union. Grapes, blueberries, and gooseberries are available as rooted cuttings. Brambles are available as root cuttings, rooted suckers or tip layers. Strawberries are available as rooted runner plants. Some nursery plants are propagated by tissue culture, a laboratory technique that ensures that the stock is as free from disease as possible. Brambles, blueberries, and strawberries are propagated by this method. Further information on the best stock to purchase is found in the following pages of this publication.

All nursery orders should be placed as early as possible. If ordering is delayed, supplies of a desired cultivar may be exhausted, or only a lower grade may be available.

Once nursery stock arrives, immediately unpack and inspect the shipment. Be sure that the proper cultivars and numbers were sent. Inspect the condition of the plants. Problems are present if the nursery stock is shriveled or dried, if root systems are soggy or darkened, or if unpleasant smells are noted. Contact the nursery at once if problems are suspected.

Try to plant nursery stock upon arrival. If planting will be delayed for 2-3 days, moisten the roots, repack in the shipping material, and store in a cool place that does not freeze. If the delay is greater than a few days, heel

in (see glossary) the nursery stock outside or plant in pots.

The planting site should be ready for planting in advance of the shipping date of the nursery stock. In Missouri, most planting is done in early spring. Some fruit plants may also be planted in the late fall. Do not plant if the soil is too wet.

Dig a planting hole large enough to accommodate the root system. Do not force a 15 dollar root system into a 50 cent hole! In general, nursery stock should be planted at the same depth as in the nursery. Fill in the hole, firming the soil with your feet. Water the newly planted stock as soon as possible. Do not fertilize fruit plants at planting time.

General Cultural Information

Pollination

Most fruits require living seeds for proper fruit development, and living seeds are the result of pollination and fertilization. Pollination, the first step in this process, results from the transfer of pollen from an anther to the stigma of a flower. If both the pollen and the stigma are from the same flower or from another flower of the same cultivar, the process is called self pollination. Fruit crops that set fruit as the result of self pollination are called **self fruitful**. Self fruitful fruit crops include most apricots, tart cherries, peaches, nectarines, grapes, strawberries, brambles, and blueberries. Other fruit crops are called **self unfruitful**, and more than one cultivar must be planted for proper fertilization. Self unfruitful crops include most apples, pears, plums, and sweet cherries. Certain fruit crops, such as blueberries, while self fruitful, will set heavier crops if a second cultivar is available for cross pollination.

Irrigation

Missouri summers can be hot and dry. In most years irrigation is necessary to produce top quality fruit, while in some years irrigation is necessary for plant survival. Plantings must be irrigated regularly throughout the growing season. One to 1 1/2 inch of rain per week is ideal. Supplemental irrigation should be applied when rainfall does not supply this amount. More water is usually needed when the fruit on the plant is growing in size, but irrigation is important at all times during the growing season. Irrigation may be applied with sprinklers, soaker hoses, and trickle (drip) systems. A deep soaking is more beneficial than several light sprinklings. Using a garden hose and a sprinkler at regular home water pressure, it takes a little over 1 hour to put 1 inch of water on a 20 x 50 foot area (1,000 square feet).

Fertilization

The first step in planning a fertilization strategy is to look at the soil test results. The nutrients most needed by fruit crops are nitrogen (N), phosphorus (P), and potassium (K). If your soil test shows adequate amounts of P (at least 50 pounds/acre) and K (at least 200 pounddacre), then N is the only nutrient that you will need on an annual basis. If the test indicated low levels of P or K, add these materials before planting.

Nutrients can be supplied to fruit crops in synthetic or organic forms. Synthetic fertilizers are usually salt forms of nutrients, and are available in both granular and liquid forms. Synthetic fertilizers are easy to apply, and the amount of nutrient applied can be carefully controlled. Nutrients are quickly available, and synthetic fertilizers can be mixed to apply more than one nutrient. "A pint is a pound the world around" is a way to remember that 2 cups of dry granular

fertilizer weighs about 1 pound. It is often easier for home fruit growers to measure by volume than to weigh. Examples of synthetic fertilizers are ammonium nitrate and 13-13-13.

Organic fertilizers are usually animal or plant wastes. Because nutrients are released as the organic material decomposes, nutrients are more slowly available. Apply organic fertilizers in advance of when fruit plants will need nutrients. The exact amounts of nutrients in organic fertilizers is difficult to predict. A single organic fertilizer usually does not supply all the nutrients that may be needed. Organic fertilizers are also bulkier and less convenient to apply. Examples of organic fertilizers are manures and compost. As a general guide, 1/2 to 1 bushel of well rotted, composted stable manure may be substituted for each cup of 13-13-13 fertilizer recommended for any fruit crop except blueberries.

Pest Management

Pest management in the home fruit planting involves much more than just applying a spray at regular intervals. While some pests are difficult to control without spraying, others can be managed with a combination of the approaches listed below, with pesticide use as a last resort. The components of a pest management program include:

Resistant cultivars:

Fruit cultivars are available that have "built in" resistance to one or more pests. Choosing resistant cultivars is an important way to reduce the need for pesticides. Resistance sometimes means immunity, but more often means that the fruit cultivar is not seriously affected by the pest. Keep in mind that resistance to one disease does not imply resistance to all diseases that may attack a fruit. Along the same lines, fruit varieties that are disease resistant may still require insecticide sprays for control of insect pests.

Example: the apple cultivar 'Liberty' is resistant to apple scab, cedar apple rust, fireblight, and powdery mildew.

Sanitation: Fruit plantings should be maintained as clean as possible. All dead and/or diseased plant material should be removed. Alternate hosts, such as wild fruit plants, should be removed in the vicinity of the planting. Overwintering sites for pests should be eliminated. Example: grape black rot overwinters in shriveled fruit (mummies), which should be removed in the fall and winter to reduce the amount of black rot in the planting the next season.

Cultural control: Maintaining a fruit planting in good health is an important part of pest management. Plant only disease and insect free nursery stock. Properly select and prepare the planting site. Prune and train properly to maintain an open plant structure, which favors rapid drying of fruit and foliage and fewer disease problems. Fertilize properly and irrigate as needed to maintain plant vigor.

Biological control: Nature provides controls for many fruit pests and, in particular, insect pests. Whenever possible, use pesticides that cause minimal harm to beneficial insects. Attract predators, such as the lady bug, assassin bug, mantis, and parasitic wasps, to the fruit planting. Biocontrols such as Bt (for caterpillars) and Nosema (for grasshoppers) are also available. Additional information on biological control is available in publications on organic fruit production.

Chemical control: Pesticides are available to control diseases, insects and weeds in the home fruit planting. Before any pesticide is applied, the home fruit grower should identify the problem and the best spray material for control. Combination pesticides are

available that contain several fungicides and insecticides to give broad spectrum control. Combination pesticides seldom control all pests, however, and the user of combination pesticides also may be applying pesticides that are not needed. A better approach is to use specific pesticides for specific pests. The home fruit grower is advised to obtain a copy of MU Guide GO6010 Home Fruit Spray Schedules (see **FOR MORE INFORMATION** section on page 45) for further information on chemical pest control. Even if you are an organic gardener, this spray schedule will alert you to potential insect and disease problems.

Some fruit plants require more pesticide sprays than others. Apples, pears, peaches, plums, French-American hybrid grapes, and seedless table grapes require a high degree of chemical pest control while disease resistant apples, sour cherries, 'Norton' 'Concord' or 'Mars' grapes, strawberries, brambles, and blueberries do not require as many chemical sprays.

Weeds, diseases, and insects are not the only pests that bother fruit plantings. Birds eat or peck holes in ripe fruit. Fruit that should be netted for protection during harvest include brambles, blueberries, cherries, and red or purple French-American hybrid and seedless grapes. Various types of scare devices are also available that may help repel birds. Deer may damage young fruit trees by rubbing off bark in the fall with their antlers or by grazing off the tips of branches. Hanging mesh (nylon stocking) bags of human hair or hard milled bars of motel size soap on the side branches of trees or shrubs will help repel deer. Rabbits and mice gnaw the bark off of young trees and may kill them. Protect the trunks of young trees during fall and winter with plastic trunk guards, burlap, or wire mesh. Clear away dry

weeds or mulch from around the base of the tree trunks to discourage mice.

Controlling weeds in home fruit crops is a challenge best met if one "begins at the beginning." Perennial weeds should be destroyed in the planting row or site before planting. After plants are established, weeds must be controlled by hoeing, hand weeding, cultivating, mulch and/or use of herbicides. For guidelines concerning herbicide use, refer to the MU Guides GO 6951 and GO 6952 (see **FOR MORE INFORMATION** section on page 45).

Tools and Equipment for Home Fruit Production

The proper tool makes the difference between enjoyment and drudgery. Following is a list of tools and equipment that will keep the jobs associated with home fruit production from becoming drudgery. Whenever possible, purchase the highest quality tools. Good tools will provide years of use.

Pruners: Useful for pruning smaller stems and fruit clusters. Two types are available, the side cut and the anvil cut. The side cut is preferred, as it delivers a clean cut without crushing stems. Left handed pruners are available.

Loppers: Useful for making larger cuts, and for reaching inaccessible areas. Side cut loppers are preferred for the same reason mentioned above.

Saws: Pruning saws or small chainsaws are useful for large cuts. Pruning saws are fine toothed and designed to cut on the draw stroke. Small chainsaws are useful for larger cuts and to remove trees.

Shovels and spades: Useful for working the soil, digging planting

holes, transplanting, and removing weeds and plants.

Turning forks: Useful for the same jobs as shovels, as well as spreading mulch and manures.

Hoes: Useful for weed control and planting.

Sprayers: Several options are available for the home fruit grower. The following are all manually operated.

Compressed air sprayer: spray materials are distributed by compressed air built up by hand pumping. Useful for smaller plantings and small trees (up to 10 feet tall). Hand held and small capacity (1-5 gal).

Trombone sprayer: spray mixture is pumped from a container by the manual sliding action of the sprayer. Useful for taller trees (up to 20 feet tall).

Knapsack sprayer: a compressed air sprayer that is carried on the back. Sprayers are also available that are powered by gas or electric motors, as well as models that are powered by tractors. This type of sprayer is useful for larger plantings or large trees.

Before reading the various sections of fruit culture directions, note that this publication is basic and tailored to a traditional or formal home fruit gardening approach. Edible landscaping, decorative, and space saving training and pruning systems, container gardening, and similar approaches are not discussed; however, there are many popular references on these subjects available in the gardening sections of libraries or bookstores. See the **FOR MORE**

INFORMATION section on page 45 for additional reading.

CALENDAR OF EVENTS IN THE HOME FRUIT PLANTING

January

- prepare pest management strategy
- purchase pesticides and fertilizers
- clean, sharpen, and/or repair tools and equipment
- prune apple and pear
- sanitation (prune out fireblight strikes, remove black rot and brown rot mummies)

February

- prune stone fruits
- mow fall bearing brambles
- prune grapes
- prune summer bearing brambles
- prune blueberries
- sanitation (remove mummies and diseased plant parts)
- apply dormant sprays

March

- fertilize fruit plants (inorganic fertilizers)
- remove mulch from strawberries
- frost protection (esp. strawberries)
- plant new nursery stock
- implement pest management strategy

April

- frost protection (esp. strawberries)
- remove trunk wraps from trees
- weed control begins
- pest management

May

- train new shoots on trees
- thin fruit on tree fruits if necessary
- strawberry harvest begins
- pest management

June

- summer bearing bramble harvest begins
- blueberry harvest begins
- gooseberry harvest begins
- cherry harvest begins
- strawberry renovation
- irrigate as needed
- pest management

July

- peach harvest begins
- apple harvest begins
- pear harvest begins
- prune out dying bramble floricanes
- irrigate as needed
- pest management

August

- grape harvest begins
- fall bearing bramble harvest begins
- fertilize strawberries
- irrigate as needed
- pest management
- prepare nursery orders early

September

- irrigate as needed
- pest management

October

- clean up the fruit planting
- apply manures and other organics
- fall preparation for spring planting
- paint trunks of young trees

November

- apply strawberry mulches (late)
- rodent control, apply trunk wraps

December

- sit down with a hot mug of cider, take out the nursery catalogs, and start planning next season!

GLOSSARY OF FRUIT PRODUCTION TERMS

BARE ROOT stock is available from the nursery without soil on the root system. This type of nursery stock is available during the dormant season and is the type of stock generally available from mail order nurseries.

BERMS are raised ridges that run the length of the planting row. Berms for tree fruits are usually 6 to 10 feet wide and 18 inches high. Berms for small fruits are 2 to 4 feet wide and 12 inches high. Berms are useful if the planting has a drainage problem.

BRAMBLES refers to raspberries, blackberries, and other related fruits.

CONTAINER GROWN stock is available already established in a container of growing media such as soil.

CULTIVAR (or variety) is the "given name" of a special selection of a particular type of fruit. "Golden Delicious" is a cultivar or variety of apple and "Concord" is a cultivar or variety of grape.

DESSERT QUALITY refers to the quality of the fruit when eaten fresh.

FERTILIZERS supply nutrients essential for plant growth. Fertilizers may contain a single nutrient or several nutrients. Different types of fertilizers include:

Dry, granular fertilizers - fertilizers that are generally applied to the soil in a dry form.

Liquid fertilizers - soluble fertilizers that are dissolved in water before application to the soil or plant foliage.

Organic fertilizers - decomposing plant or animal waste products.

Slow release fertilizers - dry fertilizers that are prepared in such a way that nutrients are released over an extended period of time.

GRAFTING (OR BUDDING) is the usual way tree fruits are propagated. A grafted tree consists of two parts joined at the graft union, the **rootstock**, which forms the root system, and the **scion**, which form the fruiting portion of the tree.

HEELING IN is a method of storing fruit plants until planting. A trench is dug large enough to accommodate the root systems. The root systems are placed in the trench, which is filled with dirt.

PESTICIDE is a chemical that is used to control pests. Pesticides include:

Fungicide - controls diseases caused by fungi.

Antibiotic - controls diseases caused by bacteria.

Insecticide - controls insects.

Herbicide - controls weeds. Herbicides may be **preemergent** (control germinating seeds) or **postemergent** (control existing plants).

POME FRUITS refers to apples, pears, and related fruits.

PROCESSING QUALITY refers to the quality of the fruit when used for canning, freezing, drying, in jellies and jams, or for other cooking or baking uses.

RESISTANCE means the ability to fight off or to keep safe from. Disease resistance means the plant has some ability to keep from contracting certain diseases.

STONE FRUITS refers to peaches, nectarines, plums, cherries, and apricots.

SUSCEPTIBLE means unable to fight back or to keep safe from. Disease susceptibility means the inability to resist disease.

TISSUE CULTURE stock is a type of nursery stock that is produced under sterile conditions and is as disease- and insect-free as possible. This type of nursery stock is available for brambles, blueberries, and strawberries.

WINTER HARDY means the ability to withstand low winter temperatures. This is not to be mistaken with the ability to survive late frost during blossom. Apricots, for example, have very winter hardy buds that can withstand temperatures down to -25°F. Apricots blossom so early in the spring, however, that they lose their flowers to late frosts.

APPLES

Apples are well adapted to Missouri and completely hardy. Generally, apples will require a full spray schedule of 12 to 14 sprays applied at one to two week intervals through the growing season. Some apple cultivars have disease resistance and do not require as many sprays. These should be considered by home growers.

General: Apple trees have a long life and with proper care can produce for twenty-five years or more. Yield ranges from 5 to 10 bushels of fruit per mature tree. Season of harvest extends from July through October.

Cultivars:

Jerseymac - ripens early, red color, medium fruit size, dessert use and baking, McIntosh type, requires several pickings.

Lodi - ripens early, yellow color, large fruit size, good for sauce, short storage life.

Paulared - ripens early, red color, medium fruit size, dessert use and baking.

Gala - ripens mid season, red-orange medium size fruit, dessert use, fireblight susceptible.

Jonathan - ripens mid season, red color, medium fruit size, all-purpose apple, fireblight disease can be a problem.

Ozark Gold - ripens mid season, yellow color, medium to large fruit size, dessert use and baking, russet free, originated at the State Fruit Experiment Station of SMSU.

Empire - ripens mid season-late, red color, medium fruit size, all-purpose apple, stores well.

Golden Delicious - ripens late, yellow color, medium to large fruit size, all-purpose apple.

Red Delicious - ripens late, red color, medium to large fruit size, dessert use.

Rome Beauty - ripens late, red color, medium to large fruit size, baking and sauce. stores well.

Arkansas Black - ripens late, dark red, woody but softens in storage, long keeping.

Redfree - ripens early, red color, large fruit size, dessert use and sauce, resistant to apple scab and cedar rust.

Pristine - ripens early, yellow with red blush, dessert use and sauce, short storage life, resistant to apple scab, susceptible to cedar rust and powdery mildew.

Jonafree - ripens mid season, red color, small to medium fruit size, dessert use and baking, Jonathan type, resistant to apple scab and powdery mildew.

Liberty - ripens mid season, red color, medium fruit size, dessert use, resistant to apple scab, cedar rust, fireblight, and powdery mildew diseases.

Enterprise - ripens late, red color, dessert use and baking, resistant to apple scab and powdery mildew diseases.

Goldrush - ripens late, yellow with red blush, fresh use and baking, resistant to apple scab, susceptible to cedar rust, powdery mildew and black rot.

Freedom - ripens late, yellow color with red blush, medium fruit size, dessert use, resistant to apple scab, cedar rust, fireblight, and powdery mildew diseases.

Spacing: Apple cultivars on seedling or MM 111 rootstocks are self supporting. Semi-dwarf apples may require support and full dwarf will require support by staking or trellising. Seedling rootstock apple trees will grow to 25-30 feet, require a 25 foot in-row by 35 foot between row spacing, and take 4-6 years to bear fruit. MM 111 rootstock apple trees will grow about 75% of seedling tree size, require a 20 foot in-row by 28 foot between row spacing, and take 4-5 years to bear fruit. M 7-A semi-dwarf rootstock apple trees will grow to about 60% of seedling tree size, require a 16 foot in-row by 24 foot between row spacing, and take about 3-4 years to bear fruit. Apple cultivars on MM 111 or M 7-A rootstocks are recommended for the home grower. Those interested in planting other semi-dwarf or full dwarf apple trees should contact the Fruit Experiment Station concerning spacing and support requirements.

Planting: Plant trees in the spring as soon as the ground can be worked. Trees are usually obtained bare-rooted. Keep roots moist during planting. Water trees after they are set. Refer to bulletins 40 and GO6021 for additional information (see **FOR MORE INFORMATION**, page 45).

Pruning and Training: Training is done the first three years to form a central leader in the tree and establish the scaffold limbs. Start the training process immediately after planting. If the newly set tree is an unbranched whip, cut it back to 30 inches above the ground. If the tree has branches, select up to four that form wide angles (45° or larger) with the trunk. It is desirable to have these branches separated 4 to 6 inches from each other along the stem and spaced around it. Remove any branches within 20 inches of the ground and prune the top at 12 inches above the highest branch. Of the remaining branches, prune to about three-fourths their length. IN THE SECOND AND THIRD YEAR dormant season, select additional branches to form the lower scaffold limbs. Do not allow these limbs to outgrow the central leader. Light pruning will keep them smaller. Refer to Figure 2 for an illustration of central leader training. Refer to Bulletin 40, Training and Pruning Deciduous Tree Fruits, for more information in this important area (see **FOR MORE INFORMATION**, page 45).

Pruning is done every year during the dormant season (January through March). Pruning consists of removing broken or crossing branches, watersprouts (shoots that grow straight up from the upper side of scaffold limb), and any crowding branches. When trees grow beyond their allotted space, light pruning will keep

Figure 2. Central Leader Training System

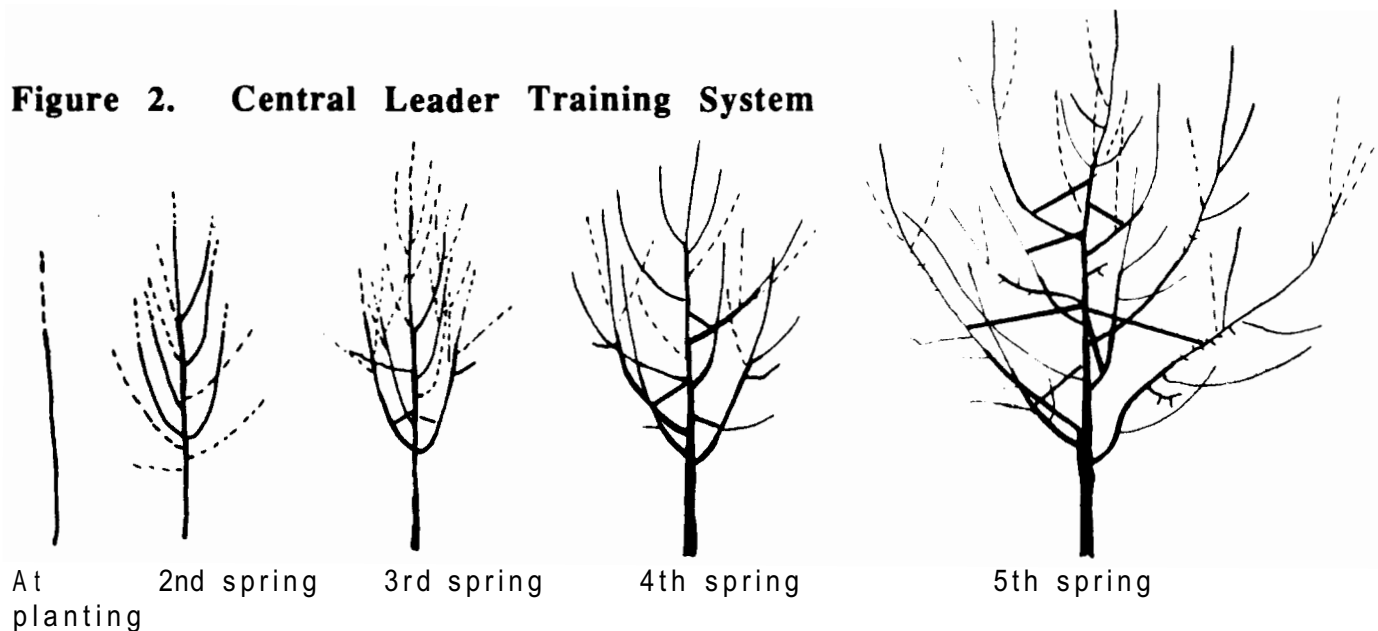


Figure 3. Multiple Leader Training System

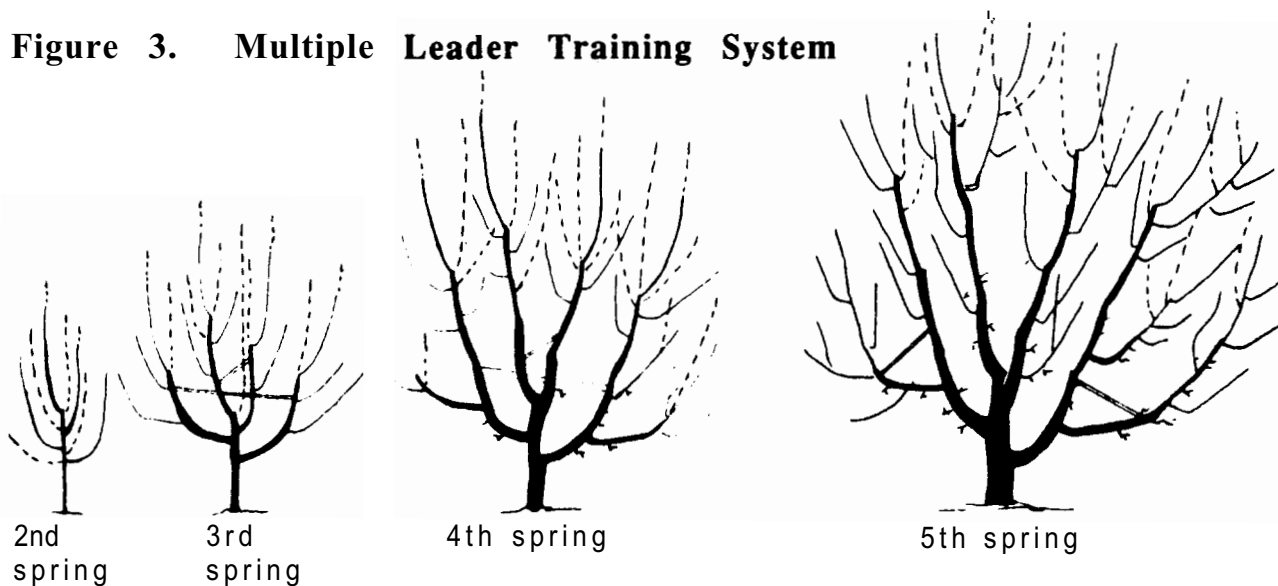
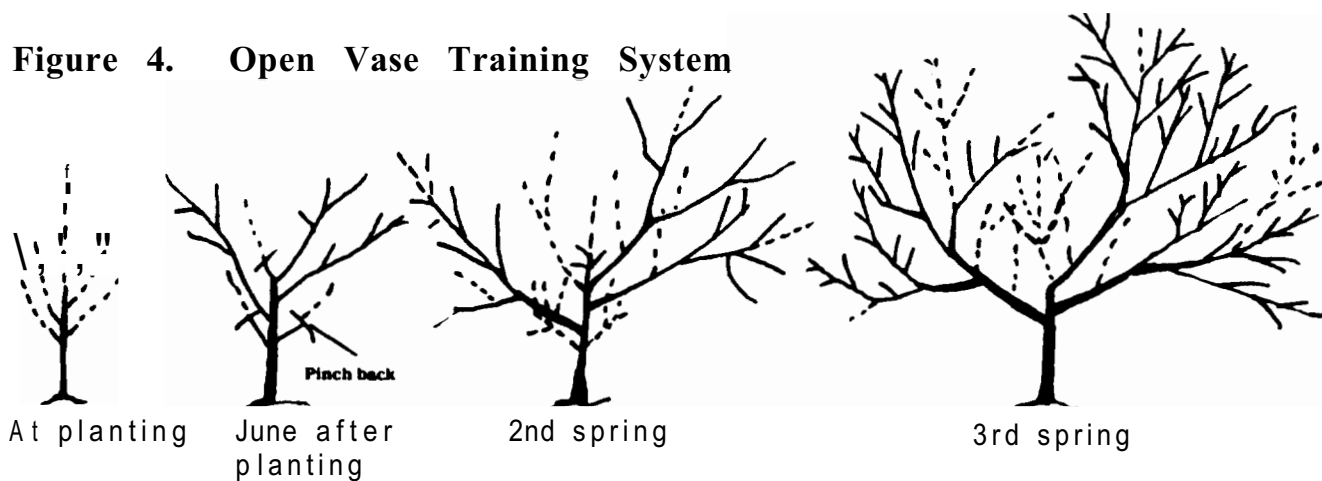


Figure 4. Open Vase Training System



Figures 2 and 3 are reprinted from Training and Pruning Apple and Pear Trees, by R.L. Stebbins. Copyright 1980 by P.N.W. Cooperative Extension Services. Figure 4 is reprinted from Growing Peaches in Kentucky, by G.R. Brown et al. Copyright 1981 by University of Kentucky Cooperative Extension Service.

branches from spreading further. Refer to Bulletins 40 and GO 6021 for additional information on training and pruning (see **FOR MORE INFORMATION**, page 45).

Blossoms and Pollination: Consistent cropping from year to year can usually be obtained for apple due to its later blossoming. Late spring frost can occasionally cause blossom loss. Apples need to be cross-pollinated to insure good fruit production. Two or more cultivars need to be in the planting. Summer (early) bearing apples cannot be depended on as pollinators for fall bearing apples because of their earlier blossoming. If both summer and fall (late) apples are planted, two or more cultivars of each type should be in the planting.

Flowering will sometimes occur when trees are young. Remove all flowers or developing fruit during the first two years to prevent stunting of the tree. A few fruits can be left on the third year, but none on the central leader.

Fertilization: Do not fertilize trees at planting. Wait until they leaf out. Apples should have about 10 to 20 inches of new growth each year when young (1 to 6 years old) and about 6 to 10 inches of new growth each year when mature (over 6 years old). Apply 13-13-13, 10-10-10 or similar fertilizer at the rate of 1/2 pound or 1 cup per year of tree age (maximum 3 pounds or 6 cups per tree). Scatter the fertilizer beneath the branch spread of the tree keeping a foot away from the trunk.

Fruit Thinning: Thin apples from late May through June to 1 fruit every 6 to 8 inches of branch. Thinning promotes fruiting every year, improves fruit size and quality, and reduces stress on the tree.

Harvest: Red apple cultivars change color long before they are ripe. Ripening progression is characterized by ground color change from green to yellow, flesh softening, sweeter taste, and fruit stem loosening from the branch. As harvest season approaches, periodically sample apples for desired taste and harvest when they are crisp and flavorful. Fruit may need to be picked several times. Seeds in the apple turn fully brown when the fruit is ripe.

Summer (early) apples do not store well and need to be processed soon after harvest. Fall apples can be stored several months if they are picked before they are over mature, and are held at a cool temperature. Storage of apples in a perforated plastic bag in the refrigerator will increase the humidity and keep fruit from drying out.

Winter Protection: Young trees need trunk protection from mice and rabbits. Use plastic spiral trunk protectors, wire mesh, or paper wraps. A slightly mounded pile of crushed rock or gravel placed at the base of the tree extending about a foot from the trunk will help discourage rodents. Keep weed growth cut back around the base of trees during the dormant season. Deer may rub antlers on young trees in the fall causing limb breakage. Human hair placed in nylon stockings or hard milled motel-type soap bars can be hung on lower limbs to repel deer.

Apple Disease Problems

Scab: Apple scab is caused by a fungus that can infect the leaves and fruit. Leaves that are infected with the apple scab fungus are distorted, and have brown spots that turn black with age. Infected fruit has brown, 'corky' spots that develop around the blossom end of the fruit early in the season.

The control measures for apple scab include planting resistant cultivars; the removal of fallen apple leaves from the orchard in the fall; and the use of fungicides

to control the disease. The Home Fruit Spray Schedule is a good reference for the type of spray, the amount to use, and when to apply chemical sprays.

Cedar Apple Rust: This disease is caused by a fungus that spends part of its life cycle on red cedar, and part on apple trees. Symptoms of this disease include small, pale yellow spots that develop on the upper leaf surface, and fruit in the spring. The spots enlarge, turning an orange color. In the summer, yellow colored spots appear on the underside of the leaves.

On infected cedar trees, the fungus produces a brown gall. During rainy periods in the spring, bright orange, 'jelly-like' fingers grow out of the galls and spread spores to apple trees.

The control measures for cedar apple rust include planting resistant cultivars, the removal of the galls on nearby cedar trees, and following the spray program outlined in the Home Fruit Spray Schedule.

Fire Blight: Fire blight is a bacterial disease that can be very damaging to susceptible apple trees. Fire blight can infect all parts of the tree. The infected areas wilt, and turn a dark brown to black (resembling fire damage). After infection, the bacteria can move throughout the tree, sometimes killing it in one season.

Control measures for fire blight include planting resistant cultivars, using surface-sterilized pruning shears to remove any infected tissue (cut 8-10 inches below where you see the infection) and following the Home Fruit Spray Schedule for fire blight control.

Powdery Mildew: This disease is caused by a fungus and can cause serious losses by killing vegetative shoots, flower buds, and causing russeting of the fruit. Infected leaves have white, felt-like patches of the fungus on the underside. The leaves may be narrow and become brittle with age. Fruit that is infected with the powdery mildew fungus is russeted and may be dwarfed in size.

Control measures for powdery mildew include planting resistant cultivars and applying the necessary fungicides to control the disease.

Summer Rots: There are two fungi that can infect the leaves, branches and fruit of susceptible cultivars. The first of these is black rot, also referred to as "frog-eye leaf spot" due to the irregularly shaped, purple spots with alternating bands of light and dark colors. Infected areas on the limbs and twigs are a reddish-brown color and are slightly sunken. Infected fruit develop a brown to black rot, commonly at the blossom end of the fruit.

White rot is also caused by a fungus that produces cankers on branches and limbs as well as causing a fruit rot. Development of the disease is favored by warm temperatures. Bark cankers begin as small, circular blisters. Older cankers have papery outer bark which comes off easily. Infected fruit often looks "bleached out" at first, then turns a deep brown.

The control measures for both summer rot fungi include pruning out and destroying all infected tissue, maintaining tree vigor, and applying the appropriate fungicides to control the disease.

Apple Insect Problems: codling moth, plum curculio, aphids, mites, scales, leaf rollers, oriental fruit moth, borers. For more information, see **COMMON FRUIT INSECT CONTROL** section, page 43.

PEARS

Pears are more difficult to grow than apples because they are more susceptible to fireblight, a bacterial disease. Selection of blight resistant cultivars and careful pruning and fertilizing practices make it possible to grow pears in Missouri. Like apples, a full spray schedule is required during the growing season.

General: Pear trees have a long life and with proper care can produce for twenty-five years or more. Yield ranges up to 5 bushels for a standard size tree. Season of harvest extends from August through October.

Cultivars (European - "pear shaped"):

Moonglow - ripens early, yellow color, large fruit size, dessert use or preserving, fireblight resistant.

Magness - ripens mid season, yellow color, light russet, medium oval fruit size, dessert use and preserving, not a pollinator, fireblight resistant.

Seckel - ripens mid season, yellow-brown color, russeted, small fruit size, preserving and cooking, moderately fireblight resistant.

Starking Delicious (Maxine) - ripens mid season, yellow color, large fruit size, all-purpose pear, moderately fireblight resistant.

Kieffer - ripens late, yellow-green color, large fruit size, preserving and cooking, moderately fireblight resistant.

Cultivars (Asian - "round apple pears"):

Shinseiki - ripens early, medium round fruit size, yellow skin, dessert use, susceptible to fireblight.

Chojuro - ripens mid season, large round fruit size, brown to orange skin, russeted, dessert use, moderate fireblight resistance.

Shinko - ripens mid season, large fruit size, golden yellow skin, russeted, dessert use, moderate fireblight resistance.

Starking Hardy Giant - ripens mid season, large round fruit size, yellow skin, dessert use and pear butter, moderate fireblight resistance.

Spacing: Pears are best obtained grafted to a rootstock called 'Old Home x Farmingdale'. Cultivars on this rootstock will be self supporting. This produces a tree that has more fireblight resistance than grafting to common seedling pear rootstock. Selection 97 of 'Old Home x Farmingdale' will grow a standard size tree that will require a 20 foot in-row by 26 foot between row spacing. Selection 333 of 'Old Home x Farmingdale' will grow a semi-dwarf tree about 75% of standard tree size that will require an 18 foot in-row by 24 foot between row spacing. Asian pears should be grafted to *Pyrus betulaeifolia* or *P. calleryana* rootstocks and planted at 15 foot in-row by 20 foot between row spacing. Dwarf pears are available grafted to quince

