

## GROWING APPLE TREES IN THE HOME GARDEN

Tania Dautlick, Research Assistant  
Michael L. Parker, Extension Horticultural Specialist

Growing apple trees in the home garden can be fun and rewarding. Several factors are important to consider before planting for successful apple production. Apple variety and rootstock, site selection, proper planting, training and pruning, adequate fertility, and pest control all contribute to healthy and productive trees. A brief discussion of these considerations follows.

**Rootstocks and Tree Spacing** - All apple trees sold commercially consist of two parts that are grafted together to form the tree. The “scion” is the top portion that branches and bears fruit and is grafted onto a “rootstock”. The type of fruit is determined by the scion variety. The rootstock can be a “seedling”, which produces a full size or standard tree, or the rootstock can be “size-controlled” or “dwarfing”, which produces a tree that is smaller than full size. The rootstock determines the relative size of the tree but does not affect the type or quality of fruit that the tree bears. Different rootstocks

are desirable because they can control the size of the apple tree, reduce the time until the tree reaches fruit-bearing age, and may offer some pest resistance.

Table 1 lists some important characteristics of the rootstocks that are commercially available. Tree size is relative and is shown as a percent of the size that the tree would be on a full size seedling root-stock. Rootstock, soil fertility, and pruning can influence tree size, and therefore influence tree spacing. Table 1 suggests a range of planting distances with the wider distances for trees planted in good, fertile soils and optimum growing conditions. Trees on the more dwarfing root-stocks must be staked for the life of the tree to obtain optimum growth and to prevent leaning and potential tree breakage. Commonly used stakes consist of a 3-inch diameter wood pole or a 1-inch diameter metal conduit. The stake should be 10 feet high with 2 feet driven into the ground approximately 6 inches from the base of the tree.

**Table 1: Rootstock Characteristics.**

Rootstock	Tree Size as		Anchorage	Years to Fruit Production
	Percent of Seedling	Tree Spacing in Row (ft)		
Seedling*	100	15-18	Excellent	6-10
MM.111	85	14-18	Excellent	4-6
MM.106	80	12-16	Excellent	3-4
M.7a	70	10-14	Fair	3-4
M.26**	50	8-12	Poor	2-4
Mark**	35-40	6-8	Good	2-3
M.9**	35	4-8	Poor	2-3

\* Mature tree is 12-20 feet tall, depending on variety.

\*\* Trees should be staked and tied to the stake at planting.

Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Employment and program opportunities are offered to all people regardless of race, color, national origin, sex, age, or disability. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.



**North Carolina  
Cooperative Extension Service**

NORTH CAROLINA STATE UNIVERSITY  
COLLEGE OF AGRICULTURE & LIFE SCIENCES

**Table 2: Variety characteristics in order of maturity.**

Variety	Fruit Color	Fruit Use	Relative Bloom Time	Potential Cross-Pollinizers
Gala	Yellow-orange to red	Fresh	Early to Midseason	Golden Delicious
Empire	Dark red over green background	Fresh, cooking	Early	Golden or Red Delicious, Gala
Jonagold*	Yellow with light red stripes	Fresh, cooking	Midseason	Gala, Empire
Golden Delicious	Yellow green to light yellow	Fresh, cooking	Midseason to Late	Red Delicious Gala, Empire
Red Delicious	Red	Fresh	Early	Golden Delicious, Gala
Stayman*	Blush to red	Fresh, cooking	Midseason	Gala, Golden or Red Delicious
Rome	Blush to red	Fresh, cooking	Late	Fuji, Braeburn
Braeburn	Green with light red blush	Fresh	Midseason	Rome, Fuji
Fuji	Green with red stripes	Fresh	Midseason	Rome, Braeburn

\* Pollen produced by these varieties is sterile.

**Varieties** - The variety of apple selected should be based on fruit characteristics, bloom time and pollen compatibility. Table 2 (above) shows several popular varieties in North Carolina, listed in order of fruit maturity. Nurseries can also provide varietal information and pollen compatibility suggestions. Crabapple trees can also be used as pollinizers if they bloom at the same time as the desired variety.

**Pollination** - All apple varieties should be considered self-incompatible, meaning that they cannot pollinate themselves or any flowers of the same apple variety. The highest quality fruit is harvested when cross-pollination occurs with a suitable pollinizer variety. You will need to plant at least two varieties of apple trees together in order to maximize fruit production and quality. Make sure that the varieties you choose have overlapping bloom dates, so that both varieties bloom at the same time. Some varieties, such as Winesap, Mutsu, Jonagold, and Stayman, produce sterile pollen and should never be used as pollinizers. However, pollen from other varieties can be used to

pollinate these pollen-sterile varieties. Remember, two trees of the same apple variety cannot be used for cross-pollination. Since the pollen from apple blossoms is transferred primarily by bees, be careful not to spray insecticides during bloom when honey bees are present.

### Site Selection

**Soils** - Take a soil test prior to planting your apple trees. Your local County Extension Center can instruct you in collecting the soil sample, help you interpret the results, and provide valuable information about the soil in your county. Results from the soil test will determine the soil amendments necessary to correct nutrient deficiencies and adjust soil pH. The amendments should be worked into the soil to a depth of 12 to 18 inches where the tree will root, not just the planting hole. Apple trees will tolerate a wide range of soils as long as water and nutrients are not limiting and soil pH is adequate. Avoid heavy, poorly-drained soils and low spots, since apple trees cannot survive if water remains standing in the root zone.

**Air Drainage** - It is important to select a site where the tree will not be in a “frost pocket”, where cold air settles in low-lying areas. In a frost pocket, low spring temperatures commonly kill the blossoms or developing fruit because cold air settles around the tree. Good air drainage, especially during early spring frosts, is critical. Choose a higher site with a slope if possible so cold air will flow down away from the trees and will not accumulate around the trees. Do not plant the trees close to a fence row, wooded area, or at the bottom of a hill, as cold air drainage will be impeded.

**Other Considerations** - Apple trees require full sun and should be planted where the trees will not be shaded from large trees or buildings. Follow tree spacing guidelines that pertain to the rootstock you have chosen from Table 1. Do not plant trees near wooded areas or streams to avoid animal damage. Prior to planting, remove weeds either manually or with an approved herbicide that will not harm the young tree. If you are planting the tree in a lawn, remove the grass from the planting area in a 4-foot diameter circle. Grass competes with young trees for available water and nutrients and can significantly reduce tree growth and productivity.

### **Planting the Tree**

**Tree Purchase and Preparation** - Purchase a healthy 1-year-old nursery tree, 4 to 6 feet tall, with a good root system. A small tree with a good root system will transplant better than a large tree. When you get the tree, protect it from injury, drying out, mouse or vole damage, freezing, and overheating. If the roots have dried somewhat, soak them in water for about 24 hours before planting. If you are unable to plant the tree immediately, there are two options:

- 1) Wrap the roots in plastic along with moist sawdust or newspaper, and place the tree in a refrigerator or cooler at 40°F. Never store the tree with fruit or vegetables, as ethylene gas from ripening foods can kill young trees.
- 2) “Heel-in” the tree. To heel-in a tree, dig a trench and place the tree roots evenly in it, cover the roots with soil, sawdust or peat, and water the tree thoroughly. The tree can be kept for several weeks using this method before permanently planting.

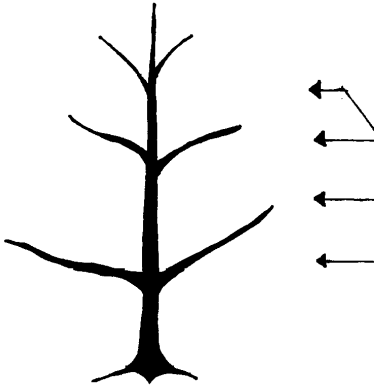
**Planting the Tree** - In North Carolina, trees can be set from late fall to early spring. To plant the apple tree, first dig a hole approximately twice the diameter of the root system and 2 feet deep. Place some of the loose soil back into the hole and loosen the soil on the walls of the planting hole so the roots can easily penetrate the soil. Spread the tree roots on the loose soil, making sure they are not twisted or crowded in the hole. Continue to replace soil around the roots. As you begin to cover the roots, firm the soil to be sure it surrounds the roots and to remove air pockets. Do not add fertilizer at planting time as the roots can be “burned”. Fill the remainder of the hole with the loose soil, and press the soil down well. **Important:** The graft union must be at least 2 inches above the soil line so that roots do not emerge from the scion. When you have finished planting the tree, water well to eliminate air pockets and provide good contact between the roots and the soil.

### **Training and Pruning Central Leader Trees**

Proper training and pruning of fruit trees is essential to the development of a strong tree framework that will support fruit production. Properly shaped trees will yield high-quality fruit much sooner and will live significantly longer. Regular pruning and training will also maximize light penetration to the developing flower buds and fruit. Additionally, a well-shaped tree canopy permits adequate air movement through the tree, which promotes rapid drying to minimize pest problems.

**Central Leader Trees** - A central leader tree has one main, upright trunk, called the “leader”. Branching should begin on the leader 24 to 36 inches above the soil surface to allow work under the tree. The first year, 3 to 4 branches, collectively called a “scaffold whorl”, are selected. The selected branches should be spaced uniformly around the trunk, not directly across from or above one another. The major lateral branches are commonly referred to as scaffold branches on which the central leader tree is “built”. Above the first scaffold whorl should be an area of 18 to 24 inches, called a “light slot”, without any branches to allow light to reach all lower leaves and fruit. This light slot is followed by another whorl of scaffolds. Maintain alternating scaffold whorls and light slots up the leader to the desired maximum tree height. The shape of a properly trained central leader

tree is like that of a Christmas tree (except with slots for light). See Figure 1.



**Figure 1. Side view of a central leader tree.**

**Newly Planted Trees** - After early winter planting, wait until just before the buds start to grow in the spring to “head”, or cut, the unbranched central leader to 36 inches above the soil surface to encourage new lateral branching. When new growth is 3 to 4 inches long, identify the most upright shoot that will continue to be the central leader. Leave it and remove all new shoots growing 3 to 4 inches immediately below this new terminal to prevent competition. This will also encourage lateral growth in the area 6 to 14 inches below the cut tip of the young tree. Branches that form 6 to 14 inches below the cut tip of the tree are less vigorous, less upright, and easier to train as productive scaffold limbs. When the lateral branches, or scaffold branches, are 3 to 6 inches long, they should be spread to a wider crotch angle that will provide a stronger framework for fruit production. Toothpicks or clothespins can be used to prop the young branches out to a 50 to 60 degree angle. This angle will slow vegetative growth, promote lateral branches, and allow the tree to initiate flowers and produce fruit sooner.

**Scaffold Training** - Improperly trained fruit trees have very upright branch angles, which result in excessive vigor and serious limb breakage under a heavy fruit load. Larger branches can be spread out using short wooden boards with a notch cut in each end for the branch to fit into. Hanging weights on the branch or tying it down with string wrapped loosely around the limb are other methods for spreading the branches. All upright growth from scaffold branches should be either pulled down to a horizontal position or removed when it is 3 to 4 inches long.

**Dormant Pruning vs. Summer Pruning** - Pruning the tree during the winter, while it is dormant, will invigorate the tree and cause it to grow and branch more the following season. To promote scaffold branch development, cut the central leader 20 to 28 inches above the highest usable scaffold whorl during the dormant season. It is best to do dormant pruning in late winter or early spring, after the risk of severe freeze is over. Be sure to remove any dead or diseased wood and dried apples at this time as well. After the tree resumes growth in the spring, continue to train the scaffold branches of the tree as you did the previous growing season. Select a new upright shoot to continue the central leader, and remove all new shoots 4 inches below it. Also select the branches to form another whorl of 4 to 5 scaffold branches. Prop all lateral branches out to a 50 to 60 degree angle.

Summer pruning will devigorate the tree and cause it to grow less in that growing season. Remove all undesirable branches directly across from one another on the central leader when they are 3 to 4 inches long. Also, select lateral branches that are spaced uniformly around the leader to prevent crowding as the limbs grow in diameter. Once the tree has filled its allotted space, lateral branches will need to be cut back to their desired length during the summer to devigorate the tree and prevent further growth, not during the dormant season. Ask your County Extension Center for information on the best way to prune your apple tree.

**Fruit Thinning** - Apple trees often set a heavier crop of fruit than the limbs can withstand. To ensure good fruit size, return bloom for the following year, and to prevent tree breakage, it is necessary to thin the fruit. Every apple blossom results in a bloom cluster of 5 to 6 blossoms. Apples should be thinned when they are about the size of a dime. Cut off enough fruit so that the remaining apples are spaced 4 to 6 inches apart, and leave only one fruit per cluster. It may seem like very few fruit remain, but you will harvest higher-quality fruit, potentially reduce insect and disease problems, and increase the chances for a full crop the next season.

**Fertility** - Adequate tree nutrition is essential for quality apple production. Determine the nutrient status of your soil by taking a soil sample prior to planting and each year thereafter at the same time of

year. Follow the fertilization guidelines provided by the soil test. This will prevent over-fertilization, will be cost-efficient, and will maintain healthy and productive trees. A leaf sample taken in July or August will determine the nutrient status of the tree and can be helpful in conjunction with the soil test. In addition to soil analysis and foliar analysis, regular observation of vegetative growth is a useful indicator of tree fertility. Optimum fertility exists if lateral, outward growth is between 12 and 18 inches per year.

If you are unable to take a soil test, a useful rule is to apply 1 pound of 10-10-10 fertilizer to each tree the first year, 2 pounds the second year, and 3 pounds the third year up to a maximum of 5 to 6 pounds for a mature tree. Always adjust rates of fertilizer application according to annual shoot growth. Apply fertilizer in late winter or early spring before growth begins. Fertilizer should be broadcast on the soil surface around the drip line of the tree. The “drip line” is the circular line at the outer ends of the branches. Avoid getting fertilizer within 6 inches of the trunk as it could burn the tree.

**Weed Control** - Controlling weeds and grasses around young apple trees minimizes competition for soil nutrients and moisture, encourages vigorous tree growth, and increases fruit size. It will also help to minimize damage from pine and meadow voles, and other rodents. Keep all vegetation controlled out to the drip line of the tree where the outer branches end. Do not use weed whips; these will girdle the tree without any visible signs of injury. Avoid mechanical weed cultivation, such as tilling, as it damages shallow tree roots. Herbicides are effective, but follow the label directions carefully and keep them off the tree. Mulch will also control weeds and conserve soil moisture, however rodents may burrow under the mulch and gnaw tree trunks and roots. When using mulch, place rodent guards around the base of the tree, and pull mulch back in the fall, leaving a 1-foot circle of bare soil surrounding the trunk.

**Disease and Insect Control** - Diseases and insects can cause serious damage to apple trees and fruit. Good sanitation practices are necessary to control pest problems. Cut out all dead or diseased wood, remove dried apples, and clear leaves and fallen

debris away from trees. Disinfect pruning tools with a 10% solution of a household disinfectant (Lysol) or bleach, before and after use and between trees. Household disinfectants, such as Lysol, will not corrode tools or ruin clothing. A regular spray program is essential for high fruit quality and healthy trees. Use a multipurpose fungicide and insecticide labeled for apples. These can be obtained from a garden center and will include application instructions. A spray to control fungus problems should be applied when the first sign of green tissue appears. A horticultural oil should also be sprayed on apple trees at the first sign of green growth in the spring to suffocate scale insects and reduce overwintering mite and aphid eggs. For homeowners with only a few trees, premixed orchard sprays are available from many garden centers. Begin applications after full bloom is over and spray every 10 to 14 days throughout the summer.

If you think you have an insect or disease problem, contact your County Extension Center immediately. It is important to identify the pest accurately so an effective treatment can be selected.

### **Harvesting and Fruit Storage**

Apples reach maturity at different times, depending on variety and climate. There is not a specific date at which you can expect to harvest your apples. Instead, you can observe your apples as they grow and inspect the fruit for certain changes which indicate maturity. The “ground” or base skin color of the apples changes from green to yellow as the fruit matures. Flesh color also loses its greenish tint and turns yellow or white. When you are convinced that the apples look mature, take a bite! A mature fruit will be crisp and juicy. A pleasing taste is the final indicator of fruit maturity.

Proper storage conditions help prolong the shelf-life of your apples. Store apples at 32°F and maintain high humidity. The crisper drawers of many refrigerators work well, but keep the fruit away from vegetables since ripening fruit gives off gas that may spoil vegetables. Apples can also be stored in plastic bags in the refrigerator to prevent fruit dehydration.

Always remember, “An apple a day...!”