B 1294

Extension Service • The Texas A&M University System • Daniel C. Pfannstiel, Director • College Station, Texas

texas apples

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TEXAS APPLES

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Interest in commercial apple culture has spread across Texas in recent years. More than 90,000 trees less than 5 years old are growing today with much of the acreage in the Hill Country. Montague County also has a producing industry, and once a significant industry existed in the Davis Mountains of far West Texas.

Much of the new interest stems from a lack of late spring freeze damage and early marketing advantages. With improved pest control methods, availability of deeper colored varieties and the advent of plant growth regulators, many fruit growers are now considering apples as a companion to other horticultural crops.

Commercial apples grow in areas of Texas which have at least 800 hours of accumulated dormant season chilling below 45°F. Normal leaves or flowers will not develop if this chilling requirement is not satisfied. Do not establish commercial apple orchards south of Tyler, Waco and Fredericksburg because of insufficient winter chilling.

Cool night temperatures during the late summer are necessary for good red color enhancement. The coolest late summer night temperatures in Texas usually do not meet the necessary low temperature requirements of older varieties. Consequently, red color development is difficult at best. Deep color varieties, discovered in recent years, may help overcome the color problem.

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SOIL

Several geographic regions of Texas have excellent soil for fruit tree production and may be adapted to apple production.

Well-drained, sandy loam soil with 3 to 5 feet of top soil underlaid with a permeable, red clay subsoil is considered ideal. Experience with apples growing on poorly drained soils has clearly demonstrated where not to plant an apple orchard.

The most serious hazard to apple production in Texas is cotton root rot, *Phymatotrichum omnivorum.*

On sites with high pH and sodium check closely for cotton root rot. Recent cotton or fruit tree production tends to increase the probability of root rot problems. Consider soil fumigation if the proposed orchard site has a history of these problems.

Post oak root rot, *Armillaria mellea*, is also a major problem. Research shows that the incidence of post oak root rot can be reduced greatly when planting of new land is delayed 1 or more years after clearing. Remove brush and trees from the site, then plow with a root plow. Burn or remove any remaining roots, trees and brush.

ORCHARD ESTABLISHMENT

When selecting specific orchard sites, consider soil type, previous cropping history, air drainage, available water sources, good roads with easy access to markets and marketing facilities.

An orchard site needs good air drainage. Cold air must flow out of the orchard during spring frosts and blooming periods. Avoid air pockets and river bottoms.

After clearing the site, level or terrace where necessary before transplanting. Avoid low areas where water stands after a rain or where internal water drainage is poor.

Establishing an orchard requires advance planning. Determine variety requirements as early as possible so nursery orders can be placed 6 months to 1 year before actual transplanting date.

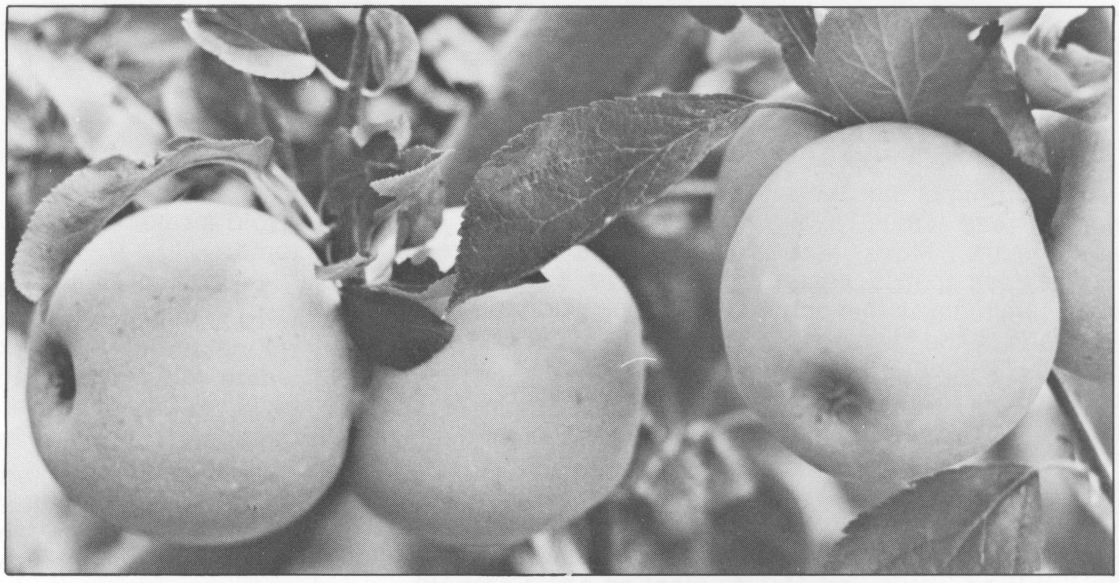
VARIETIES

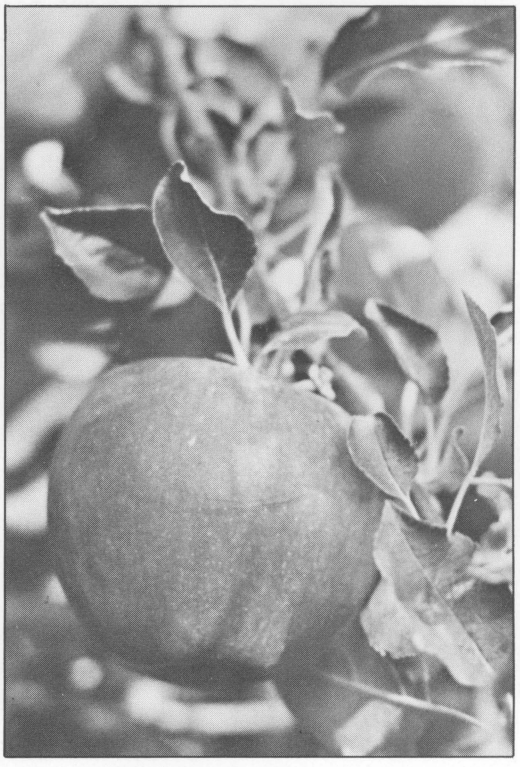
More than 150 varieties and advanced breeding lines have been evaluated at the Texas Agricultural Experiment Station at Montague. This program is on a continuing basis and is supported by variety tests at other stations in Texas and with Extension grower cooperators. Apple varieties evaluated thus far can be divided into four categories.

Outstanding Varieties

These varieties have been evaluated at Montague for more than 5 years with consistently good records.

Starkrimson Delicious is a high-yielding, spur-type variety which has typical Red Delicious fruit shape. Starkrimson is a late season apple with relatively good red color and adequate quality. This variety is one of the best performing Red Delicious Sports for Texas conditions and has been planted in large numbers in recent years. It is planted with pollinators such as





(Top photo) **Starkspur Golden is a delicious variety that can be grown commercially in northern sections of the state.**

(At left) **Jersey Mac is an early maturing, highly colored apple that looks promising for Texas.**

(Above) **Holland was once the most popular apple variety in Texas but is currently being replaced by deeper colored varieties.**

Starkspur Earliblaze, Winter Banana or Starkspur Golden.

Jersey Mac is a relatively new, early, red standard variety. It is a round fruit similar to McIntosh and is planted with pollinators listed above.

Starkspur Golden Delicious is a spur-type tree with yellow or golden delicious fruit. It is self-fertile and tends to russet and overcrop.

Promising Varieties

These varieties have been evaluated at Montague for less than 5 years but more than one season. It appears that some of these varieties may develop more color than older, outstanding varieties listed. However, with only 1 or 2 years of production records, no valid conclusion can be made. With the discovery and introduction of new, deeper-colored sports, this list will certainly have additions in the future. Plant these varieties with pollinators such as Winter Banana or Golden Delicious.

Topred is a standard tree with red delicious fruit. Color has been rated high in other evaluation programs.

Redspur is a spur-type tree with red delicious fruit. Color appears comparable to Topred, although it has not been evaluated as long.

Oregon Spur is a spur-type tree with red delicious fruit.

Mollie's Delicious is a standard tree with red delicious fruit. It is a lower chilling, early variety which can be grown and fruited in areas where standard apple varieties fail. It develops a good color in North Texas, but only slight red color in South Texas. Fruit quality is fair to good.

Prime Gold is a standard-type tree with yellow delicious fruit. Fruit flavor differs from that of Golden Delicious in being less tart yet acceptable and eye appeal is good.

Granny Smith is a standard variety with round green fruit. Flavor appears to be outstanding.

Observational Varieties

This list includes varieties that appear promising on a more limited scale or with at least one noted disadvantage.

Starkspur Earliblaze is a spur-type tree with red fruit. It works very well as a pollinator for Starkrimson.

Starking Delicious is a standard tree with red delicious fruit.

Starkspur Winesap is a spur-type tree with red fruit.

Starkspur Arkansas Black is a spur-type tree with red fruit.

Ruby is a standard-type tree with red fruit.

Richared Delicious is a standard-type tree with red delicious fruit.

Double Red Delicious is a standard-type tree with red delicious fruit.

Old Standard Varieties

Most of these varieties have been grown in commercial orchards for many years.

Holland, a long-time, standard commercial variety in the Montague County area, is an important market variety which matures very early. The chilling requirement of this variety is relatively low. Holland fruit is very large with medium to poor color. It is good as a fresh or cooking apple. Quality declines rapidly after optimum maturity is reached, and the fruit bruises easily.

King David is a small to medium-sized red apple traditionally used as a pollinator for the Holland. It is a winesap-type variety and a heavy producer.

Golden Delicious is an excellent-producing, late season variety of relatively high fruit quality. The fruit skin is slightly russetted. It is a high chilling variety and *cannot* be grown satisfactorily in areas with less than 900 hours of accumulated winter chilling below 45°F.

Jonathan is a moderate-producing, mid-season red apple. The fruit is medium to small, round shaped and has a distinctive tart flavor. Jonathan is used for fresh consumption and cooking. This apple is widely sold in 5- and 10-pound polyethylene bags. A major problem with Jonathan is that it fails to develop good red color at maturity.

Low Chilling Varieties

Homeowners in the warmer areas south of Del Rio, San Antonio, Houston and Orange can grow the Anna, Ein Shemer, Beverly Hills and Tropical Beauty varieties. These are dooryard varieties with no proven commercial value. The fruit, which ripens in July, is soft and does not develop red color.

Numerous factors have been considered in evaluating varieties at the Montague Station. Table 1 shows the performance of some of these varieties.

ROOTSTOCKS

Commercial apple production is the result of desirable varieties being grown on desirable rootstocks.

Rootstocks influence tree size, year it comes into production, tree strength and susceptibility to root problems. The M 7, M 9 and seedling apple rootstocks have been evaluated at the Montague Station for more than 10 years. Generally, M 7 and M 9 have not performed well. Use of seedling rootstock increases tree size and vigor beyond the desirable point. All three are susceptible to woolly apple aphid. With stake or trellis support, M 9 offers some possibilities with ultra high density plantings. A review of the

Table 1. Summary of apple variety evaluation at Texas Agricultural Experiment Station, Montague, in 1976

Variety	Years	Skin color	Harvest date-N. Tex.	Yield*	Fruit color*	Overall rating*	Remarks
Starkrimson Delicious	11	Red	8/23	4	4	4.5	Productive with good color
Jersey Mac	6	Red	7/1	3.5	4	4	Moderately productive with excellent color
Starkspur Golden Delicious	6	Yellow	8/27	3.5	3.5	3.75	Productive with fair color
Holland	15	Red	7/15	2.5	1	2.0	Bruises easily with short shelf life
Jonathan	8	Red	8/8	2.0	2	2.5	Poor color
Golden Delicious	12	Yellow	8/27	3.5	3	3.0	Russet skin
King David	15	Red	8/30	3.5	2	2.0	Pollinator

*Ratings: 1 = poor, 5 = excellent

rootstock trials at Montague is given in table 2.

MM 106 is a clonal rootstock used as the root system for standard varieties which normally make large trees. With MM 106 as a rootstock, these varieties will be semi-dwarf or 70 percent the normal size for a standard variety. (It has been evaluated at Montague for about 4 years.) MM 106 causes trees to produce sooner and bear heavier crops. It is adapted to sandy soils, drought tolerant, anchors the tree well and does not produce excessive suckers. MM 106 appears to have less root rot resistance than MM 111. It is resistant to the woolly apple aphid, which was primarily responsible for the decline of the old apple industry in the David Mountains.

MM 111 makes an excellent rootstock for new spur varieties. It is semi-standard as trees are 85 percent the size of standard trees. MM 111 has sustained relatively long life in research

Table 2. Summary of apple rootstock evaluation at Texas Agricultural Experiment Station, Montague, in 1976

Rootstock	Years evaluated	Resistance* Fire blight	Resistance* Woolly apple aphid	Precocity*	Percent of std. size	Anchorage*	Adaptability	Remarks
Seedling	15	4	2	1.5	100	5	Wide range	Low production early
M 7	10	3	2	3	50	4.5	Best soils only	Willowy growth
M 9	9	3	2	5	20	1	Best soils only	Poor anchorage
M 26	4	2	2	4	35	2.5	Best soils only	Induce early ripening; susceptible to fire blight
MM 106	3	4	4 to 5	3	70	4.5	Wide range (avoid wet sites)	Good
MM 111	4	4	4 to 5	2.5	85	5	Wide range	Excellent

*Rates: 1 = poor, 5 = excellent

trials in Arkansas and Alabama. It has been evaluated at Montague for about 4 years. Spur trees on MM 111 will produce early, but later than MM 106. The root will sucker slightly. It is the best anchored clonal rootstock and is very drought tolerant. MM 111 is resistant to the woolly apple aphid.

M 26 has shown some promise as a fully dwarfing rootstock. It fruits fairly well at an early age and induces early ripening which has been an important marketing advantage in Texas. Under most conditions mechanical support is necessary. One notable characteristic of M 26 is susceptibility to fire blight. With ultra high density plantings, early ripening may offset any increased cost when compared to M 9.

POLLINATION

Generally, apples are a cross-pollinated crop, with insects, such as honeybees, used for this purpose.

Orchardists have found that the placement of desirable pollinator varieties is about one pollinator tree to 10 variety trees or every third tree on every third row in standard orchards. Other combinations such as four to six rows of the desired variety between rows of pollinator trees have been used successfully. In high density plantings where trees overlap in the row in a short time, bees tend to work down the rows instead of across rows. In such cases, plant pollinator trees in every row ranging from every fourth tree to every seventh tree.

Wild bees and other insects are present for necessary cross pollination in home plantings. Placing bee hives in commercial orchards during bloom has clearly improved cross pollination. Hives usually are placed in the orchard at or before first bloom. Bees need several days to adjust to the orchard. Do not apply insecticides during bloom while the hives are in the orchard. One or two hives per acre placed in groups of five to 10 hives are adequate.

SPACING

Apple tree spacing depends on the type of system, varieties and rootstocks used. Table 3 lists a range of combinations available to growers.

Standard spaced orchards planted 20 years ago are currently in production in the Hill Country and in Montague County. These are primarily Holland or Red Delicious varieties on seedling rootstocks which are spaced 25 x 25 to 40 x 40 feet. Standard spaced orchards require lower initial investment, less water per acre and lower management input. However, early production is significantly lower. Large cultivation and spray equipment is required, and harvest costs increase considerably as trees reach maturity. Very few standard orchards are currently being planted.

Moderate to high density orchards of spur-type varieties and clonal rootstocks have given growers many advantages which were not available earlier. Orchards with spacings of 9x18, 10x20, 15x20, 12½x25 and 20x25 are currently being planted. Closer spacings are obtained by using spur-type varieties on MM 106 and the wider spacing with spur-type varieties on MM 111 or standard varieties on MM 106.

Table 3. Apple spacing systems, varieties and rootstocks

Systems	Varieties	Type rootstock	Number of trees per acre
Standard	Standard	Seedling	48 to 70
High density	Standard	MM 106	70 to 250
High density	Spur-type	MM 111	70 to 250
Ultra high density	Spur-type	M 9 or M 26	250 to 600

Four-year-old Starkrimson apples grafted onto MM 111 at the Jones Orchard in Kimble County.

Spur-type varieties bear fruit on small fruit spurs distributed all along the stem while standard varieties bear primarily on the terminal end of shoots. Spur-type varieties are more productive than a standard variety on the same rootstock. High density orchards require a higher initial investment, more water per acre and higher management input. However, production is higher in the early life of the orchard. Smaller equipment is used to maintain moderate to high density orchards and harvesting costs are lower.

PLANTING

Apples usually are planted in January, February or March. Careful handling of trees between the nursery delivery and transplanting in the orchard is important. Inspect the root system immediately after the trees arrive from the nursery. Do not allow root systems and stems to dry out. Heel in nursery trees with soil over the bundles at a 45° angle as illustrated in figure 1. Make frequent checks to maintain slightly moist roots. Locate the bed in a well drained area to prevent water from accumulating in the holes containing the roots.

Cold storage of 35 to 45°F also can be used; however, take special precautions to prevent roots and stems from drying out while in storage.

Prepare, survey and stake the orchard site before the planting operation.

A planting board has proved invaluable in determining the correct planting depth and tree alignment. Dig planting holes large enough to accommodate the root system without bunching. Deeper holes have caused problems with settling after heavy rains. Hold the tree in place at the proper depth with the planting board and fill the hole with soil as illustrated in figure 2. When the hole is half full, pack it moderately. Water trees after the hole is filled and packed.

Cut the top or whip back one-third to one-half at planting time. Apply wire mesh, aluminum foil or commercial tree wraps immediately after planting to protect the trees from rabbits or contact herbicides. A deer-proof fence is necessary in some areas.

TREE TRAINING

Apples are trained by selective pruning in February or March. Basically three types of cuts are used, including thinning out, cutting back and tipping.

Thinning out involves removing entire branches back to the main trunk or at least to a larger limb.

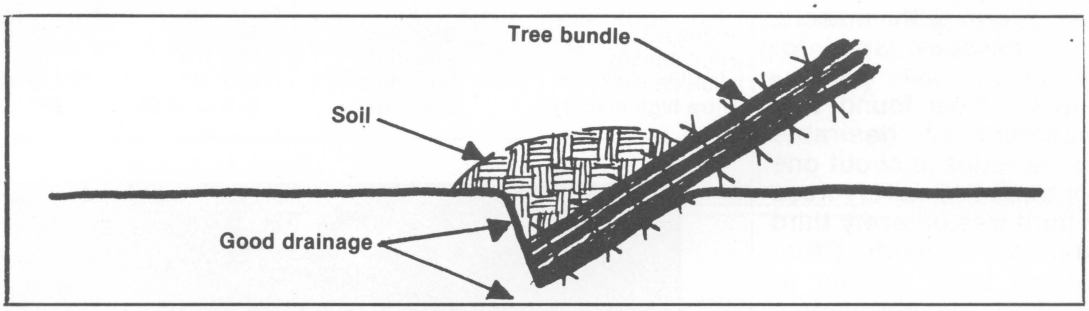


Figure 1. Apple tree bundles properly heeled in for on-the-farm storage between nursery delivery and transplanting.

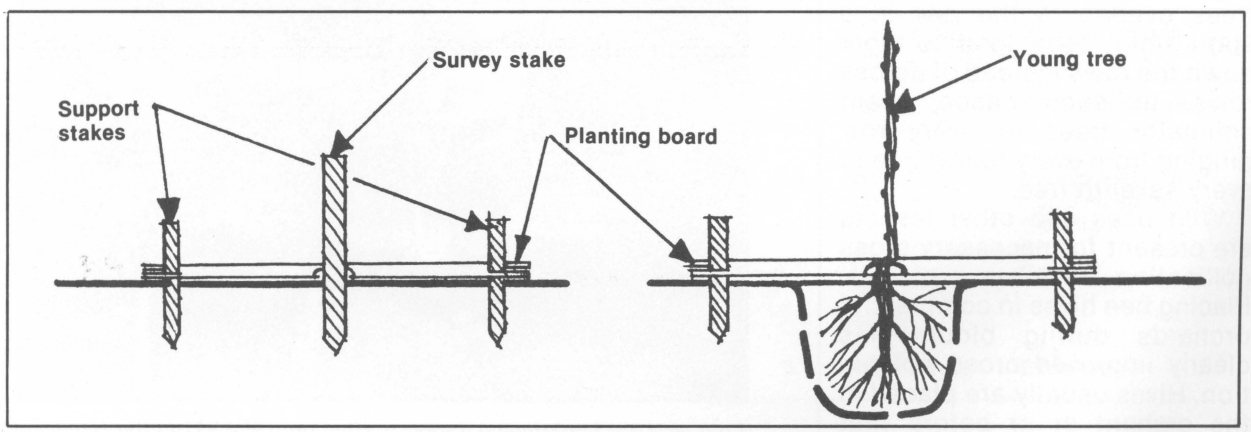


Figure 2. A planting board for exact tree placement and alignment.

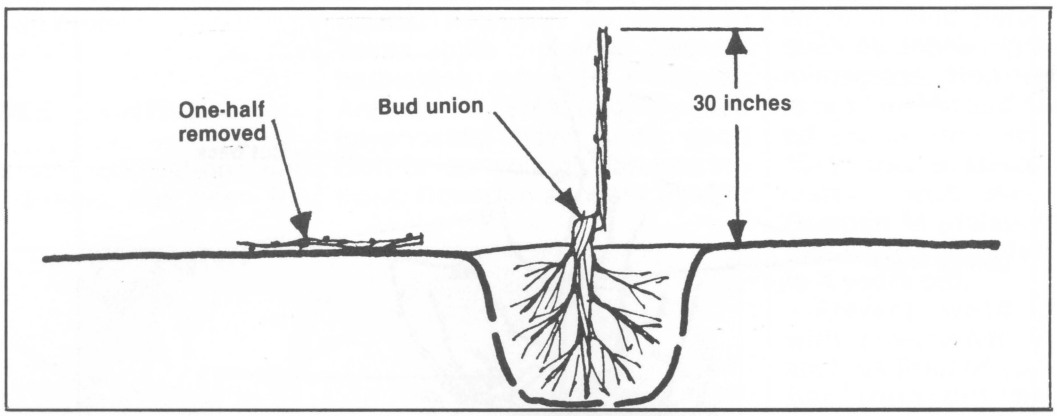


Figure 3. Proper pruning technique for an apple tree at planting time.

Cutting back consists of cutting a central leader back one-third to one-half. This cut results in numerous lateral branches along the central leader.

Tipping of 1-year stems increases development of lateral branches on side limbs which leads to a dense, compact tree with increased fruiting spurs.

Moderate to high density orchards need central leader trees. Central leader refers to the development of one main trunk to the entire height of the tree. This training begins at planting. Figure 3 shows a properly pruned tree immediately after planting. The main whip is cut back one-third to one-half and all side shoots are thinned out.

At the end of the second growing season the central leader is selected as the strongest upright shoot and cut back one-third to one-half. Three or four lateral scaffold limbs are selected and tip-pruned. All other upright shoots and side limbs are thinned out. In selecting the scaffold limbs, a symmetrical spiral staircase pattern is ideal. No limb should be directly above another. Figures 4 and 5 illustrate 1-year-old apple trees before and after dormant pruning.

After the second growing season the same type of pruning is needed. First, select a strong upright shoot for the central leader and cut it back one-third to one-half. Thin out all other upright shoots. Then select three to five lateral scaffold limbs on the central leader. The spiral pattern of lateral scaffold limbs should remain after all other side shoots are thinned out.

Tip-prune the scaffold limbs to induce lateral shoots. In Texas, leave more lateral limbs than recommended for northern areas to help prevent sun blisters. More tipping also is encouraged to stimulate maximum side branching for additional shading.

After the second season's growth, place spacers between the central leader and scaffold limbs to insure wide crotch angle development. Figure 6 illustrates the placement of spacers during the second dormant season. To make spacers, place finishing nails in the end of wood slats and cut the nails with wire cutters on the same side at each end to obtain a sharp point for easy placement

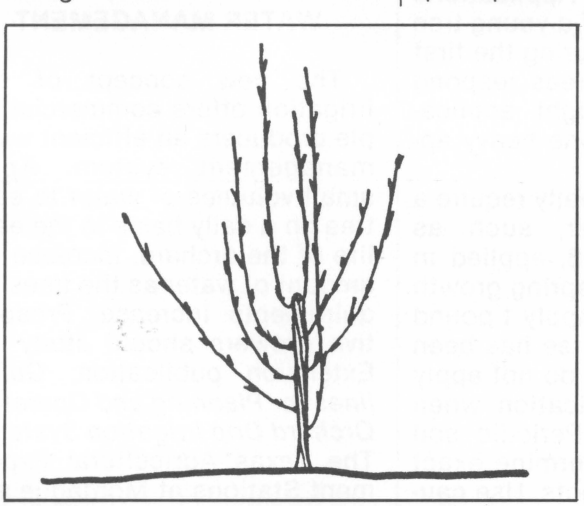


Figure 4. A 1-year-old apple tree *before* dormant pruning.

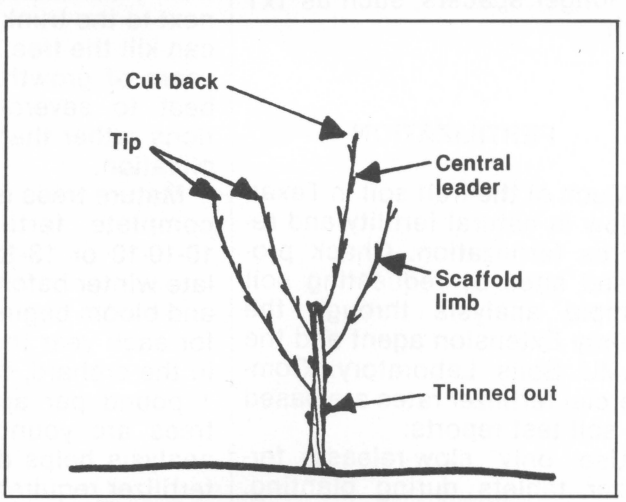


Figure 5. A 1-year-old apple tree *after* dormant pruning.

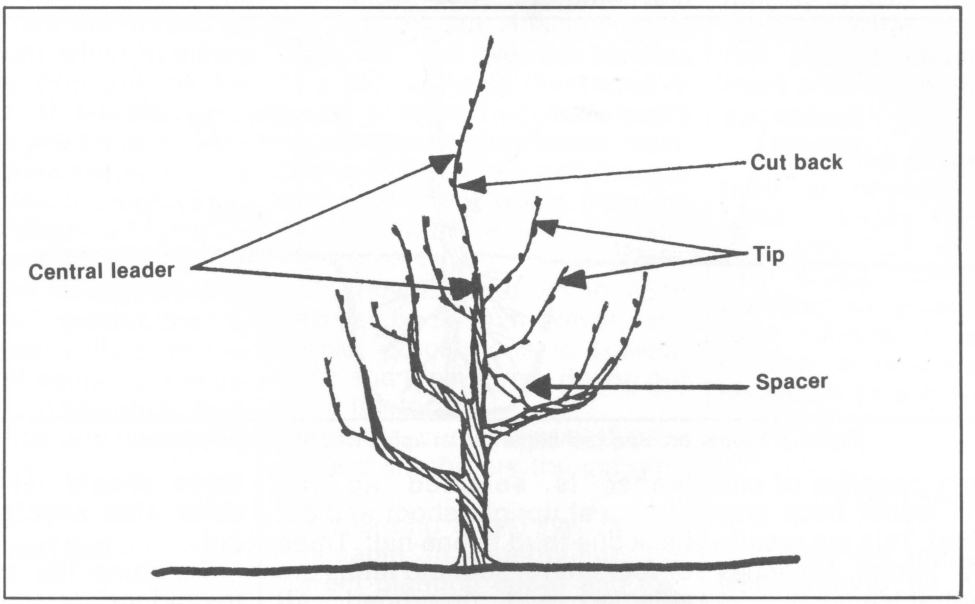


Figure 6. A 2-year-old apple tree properly trained with spacers on scaffold limbs in the dormant season.

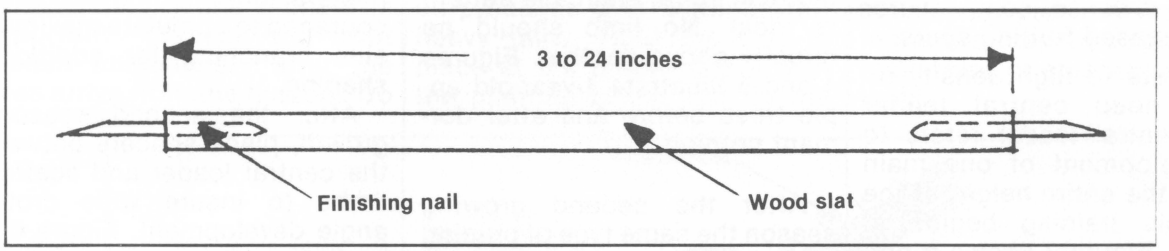


Figure 7. A homemade wood spacer for spreading apple limbs on young trees.

in the tree. Figure 7 illustrates a homemade spacer.

Spacers should vary from 3 inches to 2 feet. Use heavier wood for longer spacers, such as 1x1 inch.

FERTILIZATION

Much of the fruit soil in Texas is low in natural fertility and requires fertilization. Check proposed sites by requesting soil sample analysis through the county Extension agent and the TAMU Soils Laboratory. Commercial fertilizer rates are based on soil test reports.

Use only slow-release fertilizer tablets during planting. Apply granular fertilizers at low rates before or immediately after planting.

Apply the granular fertilizer by hand in a circle about 12 inches from the trunk. Applications next to the trunk of a young tree can kill the tree. During the first years of growth, trees respond best to several light applications rather than one heavy application.

Mature trees usually require a complete fertilizer, such as 10-10-10 or 13-13-13, applied in late winter before spring growth and bloom begin. Apply 1 pound for each year the tree has been in the orchard, but do not apply 1 pound per application when trees are young. Periodic soil analysis helps determine exact fertilizer requirements. Use caution to prevent over-fertilization and excessive growth stimulation.

WATER MANAGEMENT

The new concept of drip irrigation offers commercial apple producers an efficient water management system. Apply small volumes of water to each tree on a daily basis in the early life of the orchard. Increase the amount of water as the trees' requirements increase. Prospective growers should study the Extension publication, *Guidelines for Planning and Operating Orchard Drip Irrigation Systems.* The Texas Agricultural Experiment Stations at Montague and Stephenville have conducted ex-

tensive drip irrigation research on tree fruit crops.

WEED CONTROL

Mechanical cultivation, particularly disking, has been the primary means of controlling weeds adjacent to trees in Texas apple orchards. Contact herbicides such as Paraquat, Ansar 529 (MSMA) and Roundup (glyphosate) have given good control on young, non-bearing trees. Roundup appears to offer growers significant advantages since it kills perennial weeds such as Johnsongrass and Bermudagrass. However, Roundup is not labeled and cannot be used on bearing apple trees in 1978. Use a shield to prevent contact with the trunk. Use Dowpon M (dalapon) as a contact weed killer after trees are 3 to 4 years old.

Prevent weed germination with preemergence herbicides such as Princep (simazine), Sinbar (terbacil) and Karmex (diuron). Before these chemicals are effective eliminate Johnsongrass and Bermudagrass. Read and follow the label very closely when using agricultural chemicals.

Maintain sod or grass in the middle to facilitate movement of sprayers and harvesting equipment in irrigated orchards. Grass cover also reduces wind movement of sand and helps reduce sun scald to fruit. Mow the sod at a low height to prevent excessive water use by the grass. Do not use sod in dryland orchards.

A Golden Delicious tree in South Central Texas with sparse growth due to insufficient winter chilling.

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