Apple Orchard Management in New Mexico

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Guide H-321

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New Mexico apple producers can grow excellent apples. Apple quality depends greatly on good cultural practices—pruning, pollination, fertilization, thinning, irrigation, insect and disease control, and harvesting—as described below. For detailed information on pruning, spraying, fertilizing, and other practices, ask your county Extension agent.

PRUNING

Pruning is one of the first steps toward producing high-quality fruit, and pruning ability improves with experience. A good pruner anticipates the response the tree, will make to pruning cuts, observing the effects of past treatments on tree growth.

Moderate pruning is usually best. Heavy pruning dwarfs trees delays bearing, and is especially undesirable for young trees.

Proper pruning shapes the tree’s structure for life. Prune young trees to establish a strong scaffold system with wide-angled, well-spaced branches that will not split from high winds or heavy crops. A well-trained young tree bears heavy crops early and continues to bear efficiently.

Prune mature trees to: maintain vigorous fruiting wood; allow thorough penetration of insect- and disease-control sprays; permit light penetration for improved fruit color and size; and keep trees at a desirable height for easy picking.

The dormant season is the best time to prune fruit trees, although watersprouts and dead or diseased branches may be removed any time. Prune bearing apple trees regularly, preferably every year; it is a mistake to neglect trees for years and then prune them severely. Old trees, however, can sometimes be rejuvenated with heavier pruning than younger trees require.

POLLINATING AND FRUIT SET

New Mexico consumers like 'Red Delicious' apples, a variety that produces only small crops in many areas of New Mexico. Several factors, generally related to poor pollination and fruit set, may be responsible. 'Red Delicious' is also more susceptible to damage from low temperatures just before and during bloom than most other apple varieties.

Because 'Red Delicious' is self-sterile, it must be cross-pollinated with another variety to set fruit. There are several ways to cross-pollinate 'Red Delicious':

- Plant a pollinizer; 'Jonathan' is a good variety, and 'Red Delicious' can also be used. Because one pollinizer may fail to bloom at the right time in some years, planting more than one will ensure pollination.

- In solid plantings of 'Red Delicious', graft a pollinator variety onto some trees to increase fruit set. Place bouquets of a pollinizer variety in the orchard until the grafts come into flower.

- Place at least one strong hive of honeybees per acre of apples. Pollen inserts may also be used in orchards lacking pollinating varieties.

Fruit set is affected by sunlight, temperature, tree vigor, pollination, and some spray materials

used in orchards. The following will help ensure fruit set:

- Keep trees growing vigorously; weak trees do not set fruit well.

- Apply nitrogen early in the spring so trees absorb it before they bloom; nitrogen applications aid fruit setting.

FERTILIZING

Like over-pruning, over-fertilizing may cause fruit to be too large, poorly colored, and susceptible to bitter pit, a disease of stored apples. To produce firm, medium to large apples, prune and fertilize trees consistently from year to year.

Nitrogen

Nitrogen is the element most frequently deficient in New Mexico apple orchards. The best indicators of nitrogen deficiency are tree growth and performance: vigorous trees grow 6–10 inches per year and bear good crops regularly. Soil tests alone are not adequate to determine nitrogen needs, but they are useful in determining salt accumulation and mineral toxicities, and may reveal excessive fertilizer applications. Leaf analysis also provides a fairly reliable indication of the nutrient condition of an apple tree.

Fruit trees respond to any form of nitrogen. Do *not* fertilize apple trees the first year. As a general rule of thumb for young trees, apply 1/4 lb of actual nitrogen per inch of trunk diameter. Do not apply nitrogen to young trees after the middle of June because late applications may prolong growth into the fall, increasing susceptibility to winter injury.

In mature trees, fertilizers may be applied to the soil any time after harvest to help replenish carbohydrates lost to fruit development. For mature, established orchards, apply 150 lb of actual nitrogen per acre (or 750 lb/a ammonium sulfate), half the amount after harvest and the other half before July.

Split applications may provide better results, especially in sandy soils. Adjust application levels up or down, depending upon crop size, amount of annual terminal growth, pruning and cultural practices, and the color, maturity, and quality of the fruit.

Foliage sprays containing nitrogen may increase fruit set, but they do not supply trees with all the nitrogen they require.

Phosphorous

Because it is more soluble than other forms, the only form of phosphorus that provides good results for apple orchards is monoammonium phosphate (MAP). Apply about 200 lb/a every other year.

Minor Elements

Iron. Due to high pH in New Mexico soils, iron deficiency is the most common nutritional problem in apple orchards. Iron-deficient orchards will show interveinal chlorosis, or yellowed leaves with green veins. Affected trees may be treated with foliar applications of iron chelates, iron sulfate plus uran (foliar urea), or similar compounds; however, this is a temporary measure and does not correct the basic cause. Two application are usually necessary to correct an iron deficiency. Apply the first spray about four weeks after bloom and the second about three weeks later. **NOTE**: These sprays may injure pears.

Zinc. The visual symptom of zinc deficiency is small, thin leaves. With acute deficiencies, leaves also appear chlorotic (pale yellow), and new growth is limited to a short rosette. The first symptoms of zinc deficiency in spur-type 'Red Delicious' apples may be limited numbers of small leaves on spurs, poor fruit set, and small fruit.

Because our soil pH is high, zinc deficiency is common in New Mexico and spray applications of zinc are necessary in New Mexico apple orchards. Where zinc levels are known to be low, make annual spray applications at low rates, either after harvest while leaves are still green and active, or early in the spring. Higher rates of zinc can be applied in spring than in fall. With an acute deficiency, both fall and spring applications may be necessary.

If zinc deficiency symptoms appear during the growing season, avoid the use of zinc sulfate because of potential injury to fruit and foliage. Various zinc chelates and organic complexes that reduce the potential for injury are available.

Copper. Copper deficiency will cause terminal leaves on part or most of the tree to turn yellow, wither, and fall. Applying as little as 4 lb copper sulfate (or its equivalent) per acre should correct the symptoms. **NOTE:** Copper treatments may cause fruit russeting on pear trees.

THINNING

Thinning is the process of removing excess fruit from the tree early in the season. Most varieties of apples need thinning, which reduces the tendency toward biennial bearing and helps increase fruit size, color, and quality. Thinning regulates tree load and increases tree "repeat" bloom, or bloom in the next year. Trees that bear average loads year after year produce high quality fruit, while overloaded trees produce poorly colored, small fruit and are weakened by the large crop.

Fruit can be thinned by hand, but labor for hand-thinning is expensive and often unavailable; therefore, chemical thinning is essential for commercial apple growers. Several chemicals have been used successfully for thinning apples, including Ethrel®, Sevin®, and NAA (naphthalene acetic acid).

Thinning is most necessary in the peripheral areas of a tree and less so on the inside of the tree. One way to thin selectively is through hand sprayers to treat only areas of the tree that require thinning. If a speed sprayer is used, block the lower jets on the air carrier equipment so the spray is directed upward and outward.

IRRIGATING

An orchard's water requirements vary from season to season, depending on weather conditions, cover crop, soil type, and fruit load. The best way to determine the need for irrigation is to examine the soil at a depth of 2–3 feet.

Wet orchard soils to a depth of about 3 feet at each irrigation. The time required for water to penetrate to this depth varies with individual orchards and soils. Use a steel rod or soil auger to check the depth of water penetration; in most soils, a rod can be easily pushed into the soil as far as the water has penetrated. Water should penetrate the soil at least 2-1/2 feet.

In young orchards, avoid late and heavy irrigations that may delay maturity and make trees susceptible to winter injury. One or two irrigations are highly recommended during the winter. Avoid wide fluctuations in soil moisture and do not keep soil excessively moist for more than a few hours.

CONTROLLING PESTS

A sound pest-control program increases production and improves fruit quality. A practical program consists of good cultural practices plus pest control by appropriate chemicals applied thoroughly at the right time.

Spray failures are often due to improper application (usually too little and too late), rather than the material in the spray tank. Every part of the tree, leaves, and fruit must be covered completely for satisfactory control.

Although chemicals are one of the most effective weapons for combating orchard pests quickly, they should be used only as a supplement to good orchard management— keeping the orchard clean and healthy. Chemicals are not substitutes for good cultural practices.

Codling moth is by far the most common pest in New Mexico apple orchards. To determine the best time to spray for these moths, use pheromone traps to monitor populations. A computer program based on determining heat unit accumulation can be used to calculate the best time to spray. Contact your county Extension agent for more information about this program.

Powdery mildew is the most common disease in New Mexico apple orchards, and 'Golden Delicious' apples are most susceptible. Apply appropriate control methods early.

CONTROLLING WEEDS

The need to control weeds around the base of both young and mature fruit trees has long been recognized, especially as weeds near young trees reduce growth by competing for moisture and nutrients. Weeds also harbor insects, diseases, and rodents and create a nuisance during harvest.

Weeds around trees can be controlled by hand, by mechanical tree hoes, and by chemicals. Chemical herbicides are safe, effective, easy, economical, and a proven method of controlling weeds under trees. Like chemicals for insect control, herbicides must be used at recommended rates and applied according to directions on the label.

Cover crops help control weeds in orchards, as well as improve early color and fruit ripening by reducing the amount of nitrogen available late in the growing season, especially in deep, heavy soils.

Perennial grasses and annual small grain crops are recommended cover crops; however, alfalfa is *not* recommended. Dwarf grasses such as dwarf orchard-grass are promising cover crops because they need less mowing than other grasses. Because temperatures beneath trees will be lower in orchards with cover crops than in barren orchards, late freeze damage may be higher in orchards with cover crops.

DETERMINING MATURITY

Apple quality is largely determined by fruit maturity at harvest. If apples are picked prematurely, fruit is likely to be too small, poorly colored, and off-flavor. Immature fruit is subject to diseases such as bitter pit and soft scald when stored for an extended period. Overmature apples, in addition to having a shorter storage life, have poor storage quality and develop mealy fruit that is susceptible to internal breakdown.

Although the terms *maturity* and *ripeness* are often used interchangeably, they are two distinct phases in fruit development. Apples need to complete the maturity stage before they begin ripening, as harvesting immature fruit impedes its progression toward an edible fruit or a good processing condition. Ripeness is related to internal changes in the mature apple leading to better quality development (mainly an increase in sugar content) and improved flavor and aroma.

Deciding when to harvest fruit depends on its final use. If apples are to be sold in a fresh fruit market shortly after harvest, fruit may be allowed to ripen almost entirely on the tree. If fruit is to be held in storage for an extended period, it should be picked earlier.

Sampling

For best results, begin sampling to determine fruit maturity five weeks before the earliest expected harvest date. Sample at regular intervals—at least weekly—and on the same day each week if possible. Randomly select at least five trees to represent the current crop; sample four apples from each tree picked at shoulder height, or from each side of the tree.

Indices of Fruit Maturity

There are several indices of fruit maturity. Because fruit measurements vary among cultivars, from one tree to another in the same cultivar, among orchards, and from one crop year to the next, no single index provides a consistently dependable guide for harvest maturity year after year. Use a combination of indices to determine maturity.

Ground Color

Ground color in the skin of red apples is the fruit's underlying green or yellow color coming from the amount of chlorophyll showing. Ground color is one of the most useful indices of maturity. In general, fruit advances to maturity as its ground color changes from green to yellow—the exact shade depends on the variety. The following ratings are generally used: dark green, medium green, light green, yellowish green, greenish yellow.

Ease of Separation from the Spur

In most apple varieties, fruit is ready to be harvested when it separates from the spur easily, without breaking the stem, when lifted either with or without a slight rotating movement.

Some varieties like 'McIntosh' and 'Red Delicious' tend to separate from the spur early, thereby dropping to the ground. This fruit drop may increase as a result of early frost or excess nitrogen. Other varieties such as 'Jonathan', 'Stayman', and 'Winesap' retain their fruit until it is overmature. Plant regulators such as Ethrel® (Ethephon) and NAA-related chemicals sprayed at the end of the season can alter this maturity index, as Ethrel® advances fruit ripening while stop-drop chemicals prevent fruit drop.

Firmness

Fruit flesh becomes softer as apples mature on the tree. Determine firmness by cutting a thin slice of skin and flesh from the apple and using a hand-operated pressure tester to measure the pressure necessary for a 7/16-inch plunger to penetrate the slice. Repeat this process several times with randomly selected apples.

Depending on variety, apples for commercial use are harvested at different firmnesses. If fruit will be in long-term storage, harvest when it is in the higher firmness range. If fruit is for immediate shipping or use (such as for roadside operations), harvest when it is in the lower firmness range. Harvest 'Red Delicious' apples at 15–18 lb of pressure for optimum storage; harvest 'Golden Delicious' apples at 14–17 lb. Apples with a firmness greater than 18 lb are usually immature.

Factors other than maturity such as location of fruit on the tree can affect firmness; use at least one other index in addition to firmness to determine apple maturity.

Soluble Solids

As apples mature, juice sugar content increases. Apple soluble solids content, a factor highly correlated with sugar content, is measured with a hand refractometer. Optimum percentage of soluble solids for commercial harvest depends on variety. Harvest 'Red Delicious' apples at about 10%. If fruit will be used immediately, harvest when soluble solids content is around 12%. In general, harvest apples in a 10–12% range for optimum cold-storage quality.

Starch Content

Starch content gradually decreases as the apple matures. Determine starch content by dipping slices of apples in a 75-ml solution of iodine crystals (2.5 gm) plus potassium iodide (10 gm) for one minute. Drain off excess solution and let dry for a few minutes. Starch will react with the iodine and appear as a blue-black pattern. This index is not widely used because it is not very practical and must be performed on apples that have not been stored.

Days from Full Bloom

The period from full bloom to actual harvest is fairly constant for any given variety. The average number of days from full bloom to maturity in five varieties are: 'Jonathan', 135–145; 'Red Delicious', 145–155; 'Golden Delicious', 150–160; 'Winesap', 160–175; and 'Rome Beauty', 165–175.

Color Development

To use this index, growers must be experienced with the apple variety or strain. Some varieties may be fully colored several weeks before optimum harvest time. Some cultural practices may either hasten or delay fruit color. Excess nitrogen, as well as an iron deficiency, may cause poor fruit color. Potassium applications can improve fruit color when potassium is deficient. Additional color variations may be caused by climatic conditions and soil type, as well as irrigation and various cultural practices.

Grading for 'Red Delicious' apples in the United States is primarily based on percentage of red skin color. Extra-fancy grade apples must have 70% surface area with good color, while fancy grade must be 40%. With a little practice, ratings for individual apples can be made to the nearest 5–10%.

Charts that show coloring for stages of apple maturity are available for yellow apples such as 'Golden Delicious'. 'Golden Delicious' apples progress from dark green to yellow; five ratings are generally used—dark green, green, light green, yellowish green, and greenish yellow. Compare apples in the field against colors on the chart to determine apple maturity.

Seed Color. Seeds turn brown or black as they mature inside the fruit. Make ratings for seed color as follows: seed all white, brown color beginning to show on sharp end of seed, 1/4 of seed brown, 1/2 of seed brown, 3/4 of seed brown, and all of seed brown.

HARVESTING

Deciding when to harvest is not simple. Experience gained in following fruit development, recorded measurements, and notes on climatic conditions will make this decision easier.

Harvesting is a critical operation in fruit production: an excellent crop can be ruined by careless or inexperienced harvesters and handlers. Provide pickers with proper equipment, as improper picking containers can bruise and cut fruit. Supervise pickers closely to ensure harvested fruit is not bruised and retains its good quality. Harvesting requires a grower's close attention, as it requires more labor than any other operation and high picking costs can absorb the profits from an orchard.

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