



Texas Fruit and Nut Production

Avocados

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Avocados are widely consumed in Texas, in part because of the popularity of Tex-Mex cuisine. In addition to their unique flavor, they have nutritional benefits. Avocados have more potassium than do bananas and are a good source of vitamins K, E, and B, especially B6 and B5.

The flesh is about 15 percent oil or fat, much of which is in the healthy, monounsaturated form. The fruit has been studied for its role in lowering cholesterol and limiting certain forms of oral cancer.

Avocados are tropical evergreen trees that can grow 40 to 80 feet tall. The leaves are large, leathery, and deep green with paler veins, and they live for 2 to 3 years. Mature trees will shed a portion of their aging leaves each spring during the flowering period. Some varieties drop more than others during this time. New leaves will develop almost immediately.

The avocado fruit is a large berry (Fig. 1). Other names for the fruit are alligator pear and aguacate (Spanish).

There are three species of avocados:

- Guatemalan (*Persea nubigena* var. *guatemalensis* L. Wms.)
- Mexican (*P. americana* var. *drymifolia* Blake)
- West Indian (*P. americana* Mill. var. *americana*)

Hybrids of all three species have created additional varietal types. Blooms form from January to March, with the fruit maturing in as few as 6 months for Mexican types and 18 months for Guatemalan types.



Figure 1. Avocado fruit and leaves.

Commercial production

Mexico leads the world in avocado production, with over 1 million metric tons produced annually. In the United States, avocados are produced commercially in California (65,000 acres), Florida (6,500 acres), and Hawaii (600 acres).

In Texas, production is so small that it is not reported in U.S. Department of Agriculture statistics. The only Texas counties that are suitable for commercial avocado production are in the Lower Rio Grande Valley, where avocados represent a very small percentage of commercial farm acreage.

Growers south and southwest of San Antonio have experimented with avocado varieties purported to survive the winters there with little damage. But because no formal, long-term research has been conducted on those varieties, commercial plantings should be considered very risky unless they are well protected from freezes.

Climate

The most limiting factor to success with avocado trees is severe cold:

- West Indian types tolerate almost no subfreezing temperatures.
- Guatemalan types may tolerate 26 to 30°F.
- Mexican types are the most cold hardy and suited to Texas' climate, with some varieties tolerating temperatures around 19 to 20°F as mature trees.

Possible freeze injuries to avocado trees include partial damage to the above-ground tissue, total death of all above-ground tissue, or total death of all portions of the tree (above and below ground). The extent of the injuries is affected by the cold hardiness of the variety and the depth and duration of the freeze.

The trees are also grown in protected landscapes in the lower half of the state. Trees in protected residential settings may have microclimatic advantages over those planted in orchards.

Growing avocados north of the Lower Rio Grande Valley is risky, despite the claims and testimonies otherwise. Trees sometimes escape a harsh winter or two and look promising, only to be severely damaged in a subsequent freeze with different conditions.

Soil

Although avocado trees can grow in a wide range of soil types, the most suitable soils are coarse and well drained. Avocados do not tolerate flooding or poorly drained soils. A range of pH values from acidic to alkaline is acceptable.

Because salinity can injure avocados, have the soil and irrigation water tested before planting. If salinity is a problem, use a West Indian variety as a rootstock, which will tolerate the salinity better. Mexican varieties in particular are not salt tolerant and may need to be grafted if salinity is a potential problem.

Varieties

Avocado varieties fall into one of two pollination types, A and B. They differ in the time of day (morning or afternoon) when the male and female flowers can reproduce:

- **Type A** flowers open in the morning as receptive females and close in the afternoon. They reopen the following afternoon for pollen shed.
- **Type B** avocado flowers open in the afternoon as receptive females, close overnight, and reopen the following morning to shed pollen.

In important avocado-producing areas, orchards are interplanted with varieties of both types to ensure good pollination. In South Texas conditions, the flower phases overlap enough that pollination and fruit set are rarely a problem.

Because they tolerate freezes better, the best avocados to grow in Texas are seedling varieties of the Mexican type avocado. Grow Guatemalan and West Indian types or hybrids if you accept that they probably won't survive freezes outdoors.

Fruit quality is variable, with some being more appealing than others. For the varieties described in Table 1, no formal variety trials have been conducted to determine which are superior in production, fruit quality, or freeze tolerance in Texas conditions.

Mexican varieties grown in Texas include 'Brogdon', (Fig. 2) 'Holland', 'Wilma', and 'Winter Mexican.' 'Lula' is a popular Guatemalan x West Indian hybrid variety grown commercially in the Lower Rio Grande Valley (Fig. 3).



Figure 2. 'Brogdon'.

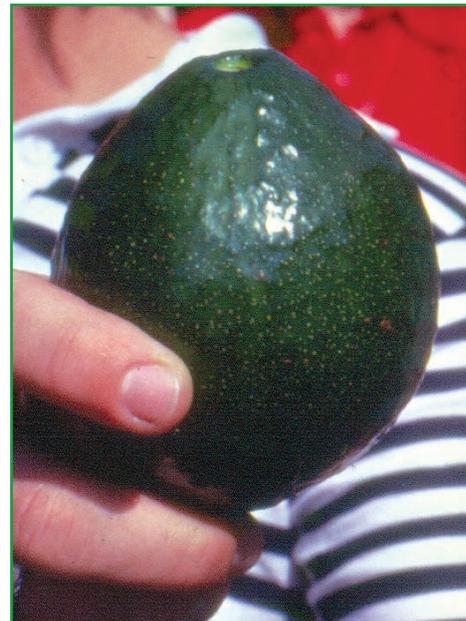


Figure 3. 'Lula'.

Fruit size varies considerably among the species. West Indian varieties produce very large fruit that is low in oil and has a milder flavor than the other types. The fruit of Mexican types is rarely larger than 8 to 12 ounces, is green to purple or black, and has very thin skin. Because the skin is so thin, the fruit are very susceptible to disease. Guatemalan varieties are essentially intermediate between the former two, and its hybrids with the other two races include many of the more important varieties in commerce.

The pebbly skinned ‘Hass’ is the most widely consumed avocado in the United States and the main commercial variety in

TABLE 1: Characteristics of avocado varieties grown in Texas

Species	Variety	Climate	Fruit	Skin	Harvest	Other characteristics
Guatemalan x Mexican hybrid	‘Hass’ seedling or hybrid variety	Little cold tolerance; plant only if it can be protected from freeze often; best in dry areas	Good quality, well liked	Thick, black, pebbly, rough textured	September–October	Most widely grown and consumed variety; ships well; main commercial variety in California
Mexican	‘Brogdon’ complex hybrid	Average– below average cold tolerance	Oval to pear shaped	Thin; purple	Summer	Flowering type B
	‘Holland’	Little cold tolerance	Less than optimum quality, thick, rubbery	Green	Summer	Found by the Holland family in Uvalde, TX; also sold as ‘Opal’
	‘Wilma’	Good cold tolerance	Large, good quality	Black	Summer	Newer variety planted in landscapes in Austin, San Antonio, and Houston areas
	‘Winter Mexican’ hybrid	Excellent cold and good heat tolerance	Large, average to fair quality	Thick, green	December	Popular in the Valley for many years
West Indian		Almost none $\leq 32^{\circ}\text{F}$	Very large	Light green to reddish purple	September – October	Mild flavor; low in oil
Guatemalan x West Indian hybrid	‘Lula’	Severe freeze damage below 27°F ; usually regrows from below ground	Nears 1 pound; pear shaped	Thick, green, slow to darken, making it good for restaurant use	October–February	Resists diseases well; grown commercially in the Lower Rio Grande Valley; the preferred rootstock for all avocados in South Texas

California. 'Hass' originated as a seedling and is thought to be a Guatemalan x Mexican hybrid. It has insufficient cold hardiness for Texas.

Site selection

When choosing a site, keep cold protection in mind, especially where frosts or freezes are common. In a residential site, the south or southeast side of a house or shed is generally the warmest at night because of north wind protection and the sun's warmth radiating from the structure.

Fruit production is greatest in full sun.



Figure 4. Avocado trees spaced 20 to 30 feet apart.

Propagation and planting

Do not grow seedlings from supermarket avocados, for several reasons: Avocados do not come true from seed; ungrafted seedlings may take up to 10 to 15 years to bear fruit; and salty irrigation water can cause moderate to severe leaf tip burn on these plants.

In Texas, the most common propagation method is cleft (tip) grafting. Other grafting methods also work. Some Mexican avocado varieties can be rooted or air-layered, but their lack of salinity tolerance will remain a problem.

Plant the trees no closer than 10 to 15 feet from the house. Space avocado trees 20 to 30 feet from each other and from other large trees (Fig. 4).

Avocado trees are produced in containers of soilless media. Just before placing a tree in the planting hole, wash much of the outer layer of media off the sides and top of the root ball. This encourages the roots to grow out into the soil of the site.

Position the grafts of the rootstock close to the soil line. Plant the trees deeper than you would other trees to set the graft at or below ground level. During the winter, mound soil around the trunk to insulate the graft with warm soil. If cold weather kills the tree to the ground, it will regenerate from the grafted wood instead of the less desirable rootstock.

In commercial plantings, newly planted trees are usually staked for support and shaded during the first several months

of hot weather and strong sunlight. Rio Grande Valley growers often place burlap-covered cages about a foot higher than the trees to protect them from sun and wind damage.

Freeze protection

To protect the trees from severe freezes, plant them deep to facilitate soil mounding. When a severe freeze is forecast, mound more soil around the trunk for extra protection, and water thoroughly 2 or 3 days before the cold weather sets in.

During a freeze, drape but do not wrap the young trees with a blanket, quilt, tarp, or plastic. Pull the corners of the covering outward and anchor them to the ground—the cover need not reach to the ground.

Set a heat source under the tented tree. Any practical heat source will probably save even the leaves—examples include decorative lights, electric heaters, incandescent lights, or camp lanterns or stoves.

North of the Lower Rio Grande Valley, growers who want to grow avocados as a commercial crop should consider erecting permanent enclosures such as high-tunnel greenhouses. These structures store the sun's warmth and can use ice formed from water sprinklers and heat from light sources to protect the trees from occasional nights of freezing.

Effective but expensive are true greenhouses with climate-control capabilities. However, the trees' size poses challenges for growing them indoors permanently.

Irrigation

Avocado irrigation is similar to that for citrus and other fruit and nut trees. Apply water at a rate and frequency that will prevent wasting water or leaving water standing around the tree for more than a few hours.

Fertilization

Annual applications of fertilizer will help the growth and fruiting of avocados. Soil testing should be conducted before planting and every second or third year thereafter to identify deficiencies in phosphorus, potassium, and other elements. Nitrogen is needed each year, regardless of soil test results.

In Year 1, divide 1 pound of ammonium sulfate (21-0-0) into three to six equal doses applied every second or third month from February to early August. Increase the total amount of ammonium sulfate to 2 pounds in the second and third years,

and increase to 3 total pounds per year in the fourth year after planting. Thereafter, apply one-half pound of 21-0-0 per inch of trunk diameter each year, split into equal applications in February, May, and August.

Pruning and training

Avocados do not need to be trained or pruned for normal growth and cropping. Prune freeze-damaged trees to remove dead wood. If only limb damage occurs, wait until regrowth begins, and cut back to live tissue.

If the tree is killed to the ground, cut it off at ground level. If the roots are alive, many suckers or trunks will emerge (hopefully above the graft line) that will need to be pruned if a single-trunk tree is desired.

Weeds

Protecting newly planted trees from weed and grass competition is critical during the first 2 or 3 years. First treat the weeds with herbicides or by mechanical means; then apply organic mulches to suppress weed regrowth.

Problems

The most common disorder of avocados in Texas is tip burn and marginal necrosis (browning on the leaf edges) caused by water stress and salinity, which is most prevalent during hot, dry weather. This problem is most acute on Mexican-race seedlings and rootstocks; it can be tempered somewhat by watering more uniformly and regularly. Have the water used for irrigation tested for total salinity and presence of particular harmful salts. Water, as with soil, may be tested at the Texas A&M AgriLife Soil, Water and Forage Testing Laboratory (<http://soiltesting.tamu.edu>).

Insects and other pests

Few insects have been documented on Texas avocados, although mites sometimes occur on the foliage.

Opossums apparently thrive on mature avocado fruit and will climb the tree to feed when none are on the ground.

Diseases

The most serious disease of avocados is anthracnose, which primarily affects fruit that are nearing maturity. It starts as tiny, brown to black spots that are circular and sunken. With time, the

spots can enlarge to ½ inch or more. They can cause the fruit to crack horizontally and vertically across the spot.

Anthracoze is particularly severe on thin-skinned varieties; it rarely causes significant losses on 'Lula' or other thick-skinned fruits.

Other fungal diseases such as cercospora spot, powdery mildew, and scab are rarely encountered in Texas but are serious problems in the humid tropics.

Harvest

An avocado tree will produce a few fruit 2 or 3 years after establishment if it is a grafted variety, has grown well, and has been protected during the winters. With good management, mature trees can produce 2, 3, or more bushels of avocados, depending upon the variety.

Mexican-race seedlings and varieties typically mature during the summer; 'Lula' and most other hybrids mature in September or October. Storage on-tree is common, and 'Lula' will store on-tree into January because of cooler temperatures.

Oil content increases with time on the tree for many varieties. Avocado fruits do not ripen on the tree--they must be harvested and held for several days before they are ready to be consumed. The optimal temperature range for ripening includes the cooler range of most home air conditioning settings.

To determine whether the avocados are mature, pick a couple of fruit and set them inside the house out of direct sun. A mature fruit will soften in 3 to 8 days. If the fruit doesn't soften, pick fruit again every week or so until they soften.

Check soft fruit for eating quality. Summer-maturing avocados will begin to drop heavily because of disease as they mature. Some types do not always soften well under Texas conditions.

Uses

Avocados are usually consumed fresh, either alone or in salads, dips, appetizers, guacamole, or pico de gallo. Overripe fruit can be pureed and frozen for later use, particularly for avocado dips and cream soup.

The peel of thick-skinned varieties is undesirable to eat but edible on thin-skinned varieties, in some cases adding unique flavors.

For more information

<http://aggie-horticulture.tamu.edu/fruit-nut>

Acknowledgment

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