TEXAS FRUIT & NUT PRODUCTION

AgriLIFE EXTENSION
Texas A&M System

Peaches

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Introduction

Peaches are the leading deciduous fruit crop grown in Texas, and it is estimated that there are more than one million trees planted statewide, only half of which are planted in commercial orchards of one acre or larger. The demand for high quality locally produced peaches remains good, and the future appears bright for the industry. The potential for growing fresh peaches is enhanced by the proximity of major growing areas to metropolitan centers, enabling growers to market high-quality, tree-ripened fruit at premium prices.

Late spring frost continues to be the single greatest factor limiting orchard profitability,

and growers should plan on losing one in six to seven crops even in the best of orchard locations. At times, frost has resulted in crop loss for two or three years in a row and has caused growers in some locations to leave the business due to loss of revenue and enthusiasm. In planning a new orchard, prospective growers should take this risk into account and plan orchard size accordingly. If peach production is to be considered as a part-time enterprise, two to five acres of orchard may be appropriate while a full-time one person enterprise may range closer to a 20 - 25 acre planting.

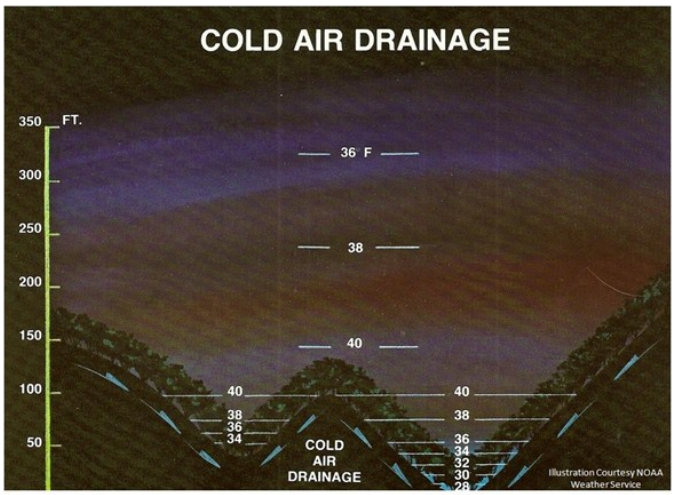
Site Selection & Initial Considerations

Selecting a site for an orchard is the single most important decision a prospective grower will make that impacts long term productivity and health of an orchard. Important considerations in seeking an orchard site include elevation/air drainage, soil type and internal drainage, water quality, previous site history and market access.

Peaches are very susceptible to waterlogged soils, so good to excellent internal soil drainage is essential to long-term tree survival. The ideal soil is a sandy loam topsoil at least 18 to 24 inches deep underlain with a red-colored, well-drained clay subsoil. A subsoil that is dull colored, blue, gray, or mottled usually has poor drainage characteristics and is not satisfactory. The subsoil, as well as the topsoil, must be relatively fertile and have satisfactory nutrient and water holding capacities, but it must be especially permeable to movement of water,

air, and roots. Take soil samples from a prospective orchard site for analysis of pH, inherent fertility, and salinity problems. If the pH is below 6.0, lime may be required before the planting beds are established. In sites with high soil pH, rootstock choices may help overcome nutritional deficiencies common to alkaline soils. High salinity levels in either soil or water may indicate that a particular site should be avoided. Clean, salt-free water is essential for commercial peach production. Irrigation water is considered adequate if it has a SAR (sodium absorption ratio) below 3.0 or total salts below 1,000 ppm. Soil samples in conjunction with annual or semi-annual leaf analysis will provide the greatest guidance in determining nutrient deficiencies and can help refine annual fertilization programs.

Choosing an orchard site with high elevation in relation to the surrounding area is the single greatest factor in reducing risk of crop loss due to spring frost. Easy movement of cold air out of the orchard is essential to minimize the serious damage from spring frosts during bloom or early fruit development and air drainage barriers should be avoided. On frosty mornings, temperatures may fluctuate as much as ten degrees from hilltop to low lying areas and can mean the difference in a full crop as compared to a complete crop loss. In addition, proper selection of cultivars (cultivated varieties) adapted to a specific location in the state is important in maximizing annual cropping potential.



Peach trees perform best on sites not previously planted to stone fruit orchards and/or that have cleared from existing forest for a number of years. Old orchard sites should not be replanted for at least three years because of soil borne disease problems. Immediately planting a site that has been cleared of standing timber, especially post oaks is not recommended because of the risk of pathogens such as oak root rot (*Armillaria mellea*).

It is important to know how the crop will be marketed in order to accurately select peach varieties and orchard size. Some of the best orchard locations are in relatively remote areas where pick your own or retail sales may not be practical. Wholesale marketing usually results in somewhat lower prices, but is an important alternative when larger orchards are planted. Peaches are extremely perishable and there is little flexibility to explore alternative markets once harvest begins.

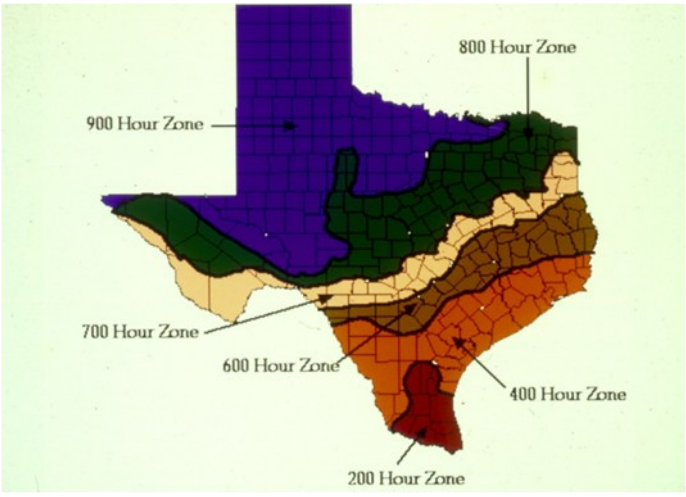
Varieties

Select varieties with long term proven production for a given area of Texas. Planting unproven or un-adapted varieties frequently results in disaster and disappointment.
Peaches require a certain amount of winter chilling in order to break dormancy, bloom and grow normally in the spring. Numerous ways of calculating chilling have been devised, but the old standard method is to measure the number of hours of winter chilling a specific location receives at or below 45° F. Rainy or cloudy days are more efficient at overcoming dormancy than clear days and sub-freezing

temperatures have little effect breaking down plant growth inhibitors. Chilling and dormancy is a complicated phenomenon, but the old standard measure of air temperature at locations is as accurate as any. If varieties are chosen that have a chilling requirement that is too low, there is a greater probability that they will bloom early and be more subject to frost. If the chilling requirement is too high, they may be very slow to break dormancy and abort fruit. Plant varieties which have the correct chilling requirement for your area. It is generally recommended that prospective grower choose varieties that have a chilling requirement 100 hours above or below what is received on average at an orchard location.

Varieties recommended for Texas are listed at the end of this publication in Table 1. The map to the right indicates chilling zones for variety selection. Commercial varieties must be vigorous, consistently bear satisfactory yields, and have acceptable disease resistance. Fruit characteristics need to meet certain minimum quality standards measured by size, shape, firmness, color, and flavor.

As the season progresses, fruit quality typically improves. However, early peaches are commonly sold for a premium price because of a lack of competition from other production areas. By using several varieties with the proper ripening sequence, the grower can have fruit over a 6 - 10 week season. Late season varieties typically have greater stone-freeness and higher quality, but demand more sprays, have significant out-of-state competition and may ultimately be less profitable for the grower.



Average number of hours of winter chilling below 45° F in Texas.

Rootstock Selection

The growth, productivity, and longevity of a peach tree are influenced greatly by the selection of an appropriate rootstock. Because peaches perform best on sandy soils where root knot nematodes may be a problem, nematode resistant rootstocks such as Nemagard are recommended in sites with coarse soils. Commercial growers on heavier, more alkaline soils, where nematodes are not an obstacle, have found Lovell or Halford rootstock to have fewer problems with micronutrient deficiencies such as iron and zinc and to have greater winter hardiness. Rootstocks such as Guardian, developed to overcome problems common in the southeastern United States, have had a very poor track record in many areas of Texas and are not recommended. Contract budding with a commercial nursery may be necessary to obtain the desired varieties on the correct rootstock. Placing an order twelve to fifteen months ahead of anticipated planting date may be needed to get the desired number of rootstock/scion combinations in a given year.

Orchard Establishment

After clearing the orchard site of trees and underbrush, remove roots, disk and smooth the area. If the site has been recently cleared of timber, consider a rotation of annual cover crops and plan on delaying planting one to two years after clearing to reduce the probability of *Armillaria root rot*.

If a site has been in native or improved grasses, starting site preparation the year before planting will greatly reduce weed control problems once the orchard is planted. Disking once or twice during the early season should reduce annual weed populations and the application of a non selective herbicide such as glyphosate in September will help reduce problems with perennial weeds such as bermudagrass and Johnsongrass.

Planting trees on terraces for maximum soil

drainage will generally extend tree life. While this practice is essential on shallow, poorly drained soils, tree performance is better even on the best of soils. Construct the terraces, or beds, so the tops are 12 to 18 inches higher than the row middles.

Spacing

Selecting an appropriate orchard configuration will ensure easy equipment passage and reduce shading over the life of the orchard. Most growers have found that rows spaced 22 to 24 feet apart is sufficient. Research on tree size shows that the maximum tree canopy is obtained with 18 foot spacing within the row; space non-irrigated or cultivated orchards 24 X 24 feet to allow for equipment passage and larger soil volume for the tree to draw from in times of drought. Higher density peach spacing has been tested in Texas and in most cases, is not recommended.

For optimal success in the planting operation, use the following steps:

1. Purchase healthy, vigorous nursery stock on appropriate rootstocks from a reputable nursery. June-budded trees ranging from 2 - 4 feet in height are the principle stock used in commercial planting. Nursery stock 30 - 36 inches tall are usually considered ideal. Contact a nursery 10 - 12 months before you plan to plant in order to assure availability.
2. Plant trees while dormant from December through early March. In our climate, early planting gives good root establishment before bud break.
3. When the nursery stock arrives, keep roots from freezing or drying out by heeling the trees in soil. This is done by opening a trench, laying the trees at a 45° angle, covering the roots with soil and watering in the heeling bed. Trim and soak the roots in water one hour before planting.
4. Make planting holes large enough to accommodate the root system. Dig the hole to fit the root system, do not prune the roots to fit a smaller hole. It is allowable to prune back diseased or damaged roots, or to cut back a few excessively long ones.
5. Plant the tree at the same depth as in the nursery.
6. Firm soil around the newly planted tree and water well to help settle the soil and to eliminate air pockets around roots. Add water as needed.

7. Cut back nursery tree to a height of 24 to 36 inches. Remove lateral branches flush with the trunk.
8. Place a grow tube or aluminum foil on the lower 18 inches of the trunk leaving six inches of the trunk exposed..

Protecting the trunk with a grow tube/tree shelter or aluminum foil helps reduce sunscald, inhibits low buds from forcing for scaffold limb formation and will aid in weed control procedures the year of establishment. Be sure to remove all of the foil after the first growing season to prevent trunk girdling in later years.

Tree Training

After planting, nursery stock is pruned to a single trunk and headed back to a height of about 24 inches. With one year old nursery stock, all lateral branches are removed. With older stock, trim back to a single main trunk, but stub lateral shoots back to allow new buds for scaffold limb formation.

Within a few weeks after growth begins in the spring, select the strongest four to five shoots arising from the top 6 inches on the main stem. They should be evenly spaced along the trunk with at least one directed into the prevailing wind. Remove all other shoots along the trunks or limbs. These few branches will grow vigorously for about 10 more weeks and then begin to lignify, or harden and turn brown, near the trunk. It is important to maintain a healthy canopy throughout the fall in order to fully harden new scaffold limbs and to maximize winter hardiness of the young tree.

First Year Care

One of the most critical phases of first year peach tree care is weed control. Left unchecked, weeds can cause the loss of the first year's growth. Most grasses and weeds are more aggressive than newly set peach trees in removing both water and nutrients from the soil. Often these small trees can be seen sitting in lush green grass with the tell tale red spots of nitrogen deficiency on their leaves.

Whether mechanical or chemical, weed control will greatly increase tree growth during the first year. Mechanical control has the advantage that no chemical toxicity will occur and can be performed by unskilled labor when available. Its disadvantages are that frequent cultivations are required for adequate control and root damage can be extensive if cultivation is too deep. Tillage equipment should be adjusted so that they cut no more than three inches into the soil to avoid extensive root damage.

Chemical weed control has become the method of choice for most growers because it is more reliable, does a better job of controlling perennial weeds, is more economical and usually does not have to be repeated as often.

Do not use glyphosate around first year trees unless the trunk has been wrapped with aluminum foil as described earlier. This is because green bark on the young trees can absorb the herbicide and cause extensive tree damage. As trees progress past the first season, the trunk bark becomes much more resistant to uptake of herbicides.

Training to Open Center System

Because they do not have an erect growth habit, peaches and other stone fruit are traditionally

trained to an open center training system. This growth form appears like a martini glass allowing full sun exposure into the interior of the tree. Following the first growing season, when the young trees are fully dormant, prune the tree back to a trunk and three, or no more than four permanent scaffold limbs. If there has been excellent growth the first season, sub-scaffold limbs can also be established approximately 24" from the crotch of the tree.

During the second growing season, the sub-scaffold limbs will continue to be developed, the tree will greatly increase in size and under ideal conditions, produce enough growth to bear fruit during the third growing season. Peaches are only borne on one year old wood, so in addition to gaining size and girth, the second year tree will grow "fruiting wood" that will be responsible the crop during the third growing season. Pruning during the second dormant season maintains and fully develops the open center form, and retains some one year old wood for fruiting the following season

Pruning

The main goals of pruning are to maintain tree form to an open center which facilitates light penetration and air circulation, and to partially control crop size by selectively thinning out fruiting wood. Peach trees bear fruit only on one year old wood. Dormant pruning is an invigorating action which results in a healthy canopy to produce the current season's crop and allow for ample production potential for the following year. Another pruning objective is to lower the fruiting zone to a height which can be hand-harvested from the ground. Topping trees at 7 -8 feet usually accomplishes this objective because the weight of the crop will bring limbs down where the fruit can be easily reached.

Additional objectives of pruning are to remove dead or diseased shoots, rootstock suckers, and vegetative water sprouts from the center of the tree. When thinning out fruiting wood, remove old gray-colored, slow growing shoots which are not fruitful and leave one-year-old, red, 18 - 24 inch bearing shoots.

Four Steps to Prune a Mature Peach Tree

1. Remove all hanger shoots, rootstock suckers, and water sprouts in the lower three feet of the tree. This removal of lower growth clears a path for herbicide applications and allows for air circulation.
2. Remove all shoots above seven feet in height other than red 18 - 24 inch fruiting shoots. Cuts need to be at selected points where the scaffold and sub-scaffold limbs extend upward at a 45 - 50-degree angle. Cuts which leave limbs sideways at a 90-degree angle should be avoided.
3. Remove all water sprouts (excessively vigorous growth) which grow toward the inside of the tree.
4. Remove all old gray wood in the three to seven foot production zone.

Always remove water sprouts in the middle of the trees any time they develop. Summer pruning immediately after harvest can help reduce shading in the prime fruit bearing area of the tree.

Peach pruning normally removes about 40 percent of the tree each winter. This reduces the number of fruit on the tree and stimulates strong growth of a healthy canopy to ripen the crop which ultimately becomes fruiting wood for the following year. Proper pruning is one of the keys to a long peach tree life.

Late-spring frost is the single greatest factor in Texas peach production, and pruning early in the year removes much of the flower bud crop that constitutes "insurance" against crop loss. The peach tree will bloom soon after pruning when chilling is satisfied and warm weather follows. Growers with only a few trees can wait until "pink bud" to prune while larger growers traditionally prune as late in the spring as they can while still allowing for enough time to complete the task. Mature peach trees often take 20 to 30 minutes to prune properly.

Fertilization

To keep trees healthy and productive, nutrient levels should be maintained in the optimal range. The only way of accurately doing this is to monitor nutrient levels in both the soil and foliage. Soil tests determine the initial nutrient needs and

can help a grower maintain soil pH in the desired range. Although applying lime will easily raise soil pH levels, it is extremely difficult to lower pH levels in calcareous soils.

Leaf analysis enables a grower to determine if the tree has obtained needed nutrients from the soil. Where elements are low, correct by appropriate means; foliar and/or chelate applications for micronutrients and ground applications for macronutrients. Collect leaf samples between July 15 and August 15. Samples should consist of fully matured leaves taken from new growth well exposed to sunlight. Take samples from the mid-shoot area and collect two or three leaves per tree. Randomly select trees across a block and include fifty to sixty leaves per sample. Trees that represent a problem area should be sampled separately from "normal" trees to help identify a limiting element. Instructions for collecting and submitting samples are available at your County Extension Office.

Fertilization of fruit trees should be dictated by the pH of the soil in the absence of a soil test. A soil test should be performed every 3 - 5 years. The ideal soil pH for peach production is between 6 and 7. Major problems with micronutrient deficiencies, especially iron and zinc, usually develop when the pH goes above 7.8. Rootstock selection and the application of chelated nutrients can be used to help overcome these site limitations

Maximum growth of young trees is obtained with small, frequent fertilizations. Newly-planted fruit trees can be fertilized the first year if they make 8 to 10 inches of growth by May. If the trees have 8 to 10 inches of growth in May, then the tree can be given one cup of nitrogen fertilizer (ammonium sulfate or nitrate). Spread fertilizer at least 18 inches away from the tree. Use extreme caution not to place fertilizers any closer to the trunk. Fertilizers are salts and improper placement can burn roots and kill young trees. Some organic sources of nitrogen also contain high salt levels, so be sure you know the material you are working with.

The second year the trees should be fertilized four times: March, April, May and June. If your soil pH is below 7.8, the first application can be a 3 - 1 -2 ratio fertilizer; if above 7.8, use only nitrogen. Apply one cup of fertilizer at the first of each month. If the trees fail to make growth from month to month, do not continue to fertilize. Only fertilize if the trees are actively growing. The third year, the trees should be fertilized four times again, using 2 cups of a fertilizer at the first of each prescribed month.

Once trees are in full production, usually in the fourth growing season, base phosphorus and potassium fertilization on soil and or leaf tissue test recommendations. For mature peach trees, most orchards require 50 to 60 pounds of actual nitrogen (N) per acre per season. Typically one half of this application is applied just after fruit set. Ammonium nitrate is 33% nitrogen while ammonium sulfate is 21% actual nitrogen, so calculate pounds of fertilizer on that basis. Additional applications are commonly made in May and June to keep canopy healthy throughout the summer. While it is traditional to broadcast nitrogen across the entire floor of a mature orchard, dry summer weather will inhibit movement into the root zone. Many growers have started applying summer applications of nitrogen through the drip irrigation system. With this approach, small, frequent doses can be made with certainty that it will be immediately available to the tree.

Irrigation

In the distant past, commercial peach orchards were grown dry land with very wide spacings and only limited supplemental irrigation. Irrigation, if used, was generally done just before harvest to increase fruit size. With the advent of drip or trickle irrigation, irrigation concepts have changed dramatically. Today, it is not recommended that any peach orchard be planted on a site without suitable water, both in quality and quantity, for irrigation. Have the water analyzed for total soluble salts (EC), sodium absorption ratio (SAR), bicarbonate and carbonate content, and pH before orchard establishment.

The following irrigation schedule works well for young peach trees using drip irrigation. However, it should be adjusted for soil type and weather conditions.

For the remainder of the life of the orchard, one inch of water per week would be in the absence of rainfall is optimal. Design irrigation systems to

apply up to 50 gallons of water per tree per day.

GALLONS OF WATER PER WEEK PER TREE						
	April	**May**	**June**	**July**	**Aug**	**Sept**
Year 1	7	7	14	28	28	21*
Year 2	14	14	28	56	56	28*

*Applying supplemental irrigation in September and October may be unnecessary if seasonal rainfall arrives.

Fruit Thinning

Peaches will begin bearing a commercial crop in the third or fourth year. Most peach varieties set far more fruit than can be grown to large size with good quality. Thinning is used to control the number of fruit per tree in order to increase fruit size and quality as well as to insure adequate vegetative growth in the trees. Prices of large fruit are usually at least twice those of small fruit and large fruit are more economical to harvest.

The earlier fruit is thinned from a tree, the greater the size response of the remaining fruit. Early ripening varieties are ideally thinned during bloom, but the risk of frost generally dictates that growers thin them shortly after fruit set. As a rule of thumb, fruit should be thinned within 4 to

6 weeks after bloom and should be thinned in order of ripening. Fruit should be thinned to six to eight inches apart along the fruiting branches which generally leaves about 600 fruit per mature tree.

Hand thinning and mechanical thinning are the only two fully proven methods currently available to the peach grower. Hand thinning is the most precise and expensive but enables growers to more carefully select the desired fruit position. Hand thinning costs range up to $250 per acre. Mechanical thinning by machine shakers has been used for several years and with careful machine operation it is quite successful. The major drawbacks are a tendency to damage trees if used improperly and the necessity of waiting for the fruit to get large enough to be shaken off. This limits the usefulness of machine thinning on early ripening varieties. Work continues on the use of mechanical thinners to assist growers in adequately adjusting crop load.

Weed Control

Weed control is one of the more important operations in peach growing. Irrigation and fertilization cannot overcome the ill effects of severe weed competition. This is especially true with first and second year trees.

Lack of weed control can cause poor tree survival, reduced growth and orchard failure.

Historically, weeds were controlled by disking and hand hoeing, but this method is usually not recommended because of the loss of irreplaceable topsoil due to erosion and the inability to move equipment through the orchard in wet weather.

The most efficient floor management system for most orchards consists of a mowed, native sod middle with a weed-free strip under the trees. Weeds in the strip are controlled chemically. Gradually widen the weed free strip from 3 to 4 feet in the first year orchard to 10 to 12 feet in a mature orchard.

Chemical weed control, manages weeds more effectively for longer periods and at reduced cost when properly used. Chemicals used in weed control can damage trees if used improperly. Read and carefully follow all label instructions when applying herbicides.

Insect and Diseases

Numerous insects and diseases damage peach trees and fruits in Texas. Major pests include San Jose scale, greater and lesser peach tree borers, plum curculio, peach twig borer, and catfacing insects. In some cases, insect populations may be monitored for presence and injurious levels of infestation through trapping. Serious diseases are scab, brown rot, bacterial spot, post-oak root rot, and cotton root rot. Fewer insect and disease problems occur in Far West Texas, but they are sufficient to warrant control measures. Commercial and homeowner spray schedules can be obtained by contacting your County AgriLife Extension Offices.

Harvesting and Handling

Texas-grown peaches are consumed primarily within the state and are hand harvested. Consumers demand dessert-type peaches that are ready to eat when purchased. Growers must therefore harvest fruits at a mature stage, and exercise care in harvesting and handling. Harvest fruit when firm-ripe and well-colored with a red blush over yellow background. When harvested at this stage, fruit ripen properly and have excellent eating quality.

Several types of containers are used for picking and hauling fruit, including half-bushel baskets, drop-bottom picking bags, wooden boxes, and plastic containers. The latter containers are about half-bushel size and are especially adapted for handling more mature fruit. They may be stacked several feet high on trailers without damaging fruit. Pads on the bottom of these containers help reduce fruit damage. Bruising is also lessened because the same container is used for picking and hauling operations. Larger operations are successful using pallet boxes with an 18-bushel capacity for hauling fruit to packing houses.

Methods of handling harvested fruits vary among growers. Many growers own or have access to packing house facilities for washing, defuzzing, grading, packing, and storing fruits. Hydrocooling to remove field heat is a valuable practice when fruits must be held in cold storage for extended periods or transported long distances. Cold-storage facilities are very beneficial to financial success with peaches. Refrigeration of harvested fruits at 32°to 35° F holds them in good condition for about 2 weeks and reduces rots, thereby permitting accumulation of surplus fruits. This helps create an orderly marketing system.

Marketing

Market emphasis is on consumer demand for high quality, tree-ripened peaches ready to eat when purchased. Today's peach market demands large fruit, preferably 2-1/4 inches in diameter or larger, free of insect and disease blemishes, and attractive, with good shape, color and maturity.

Texas produces less fruit than is consumed within its borders. The presence of major metropolitan areas permits growers to take advantage of these prime markets without hauling fruit for long distances. Although competition from other states is keen, locally-grown fruit bring premium prices.

Most peaches grown in the state are marketed by the individual grower. Growers utilize a number of market outlets, including sales to local supermarkets, packing shed operators, roadside stands, brokers and wholesalers, as well as direct sales from orchards. Many growers market a large portion of their crop retail because of greater profits. Half bushel cardboard boxes are the standard container used for wholesale marketing, but many growers utilize peck, half-peck or smaller containers for retail sales.

Table 1. Recommended Peach Varieties for Texas

High Chilling Varieties (700-1000 Hour Zones)

Variety	Chilling Requirement	Stone Freeness	Days Before Elberta
'Flavorich'	700	Cling	64
'Regal'	700	Semi-Cling	54
'Junegold'	650	Cling	46
'Surecrop'	1000	Semi-Free	42
'Juneprince'	650	Semi- Free	35
'Sentinel'	850	Semi-Free	34
'GaLa'	750	Semi-Free	34
'Harvester'	750	Free	26
'Ranger'	1000	Free	24
'Fireprince'	850	Free	20
'Cary Mac'	750	Free	20
'Topaz'	850	Free	18
'Majestic'	850	Free	16
'Redglobe'	850	Free	13
Cresthaven	850	Free	3
'Dixiland'	750	Free	3
'Redskin'	750	Free	2
			Days After Elberta
'Flameprince'	850	Free	14
'Parade'	850	Free	30
'Fairtime'	750	Free	35

Medium Chilling Varieties (450-650 Hour Zones)

Variety	Chilling Requirement	Stone Freeness	Days Before Elberta
'Flordacrest'	425	Semi-Cling	55
'Flordaking'	450	Cling	51
'Junegold'	650	Cling	46
'TexKing'	450	Cling	42
'Juneprince'	650	Semi-Free	35
'Texstar'	450	Semi-Free	32
'Southern Pearl'	650	Free	28
'TexRoyal'	600	Free	25
'Suwanee'	650	Free	22
'TexPrince'	550	Free	20
'La Feliciana'	600	Free	18

Low Chilling Varieties (150-400 Hour Zones)

Variety	Chilling Requirement	Stone Freeness	Days Before 'Flordaking'
'Gulfking'	350	Cling	6
'Flordacrest'	375	Cling	+4
'Gulfprince'	400	Semi-Free	+25
			Days After 'Flordaprince'
'FlordaPrince'	150	Cling	-0-
'TropicPrince'	150	Cling	+7
'TropicBeauty'	150	Semi-Free	+14