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IFAS Extension

Pineapple Growing in the Florida Home Landscape[1]

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Scientific Name: *Ananas comosus*

Common Names: pineapple and ananas in English, piña in Spanish, nanas in Javanese and Malay, apangdan in Philippino, and yaannat, sapparot, or bonat in Thai.

Family: Bromeliaceae

Related Species: bromiliads, Spanish moss, and tillandsia.

Origin: Central and South America and the Caribbean

Distribution: Grown throughout tropical and warm subtropical areas of the world.

History: Pineapple has apparently been cultivated by indigenous people of the tropical Americas and the Caribbean Region for thousands of years. New World explorers then distributed pineapple during the 1500s to 1700s to new areas including Europe, Africa, and Asia. The commercial export trade began during early 19th century from the West Indies. This led to further commercial development of in the Caribbean during the mid-19th century. However, with the improvement in refrigerated sea transportation by the end of the 19th century, production shifted to Hawaii, Asia, and Africa. In the U.S., Puerto Rico and Hawaii have moderately large and important industries. Pineapples are not grown commercially in Florida but are common dooryard yard plants in warm locations throughout the state. The first recorded introduction of pineapple into Florida was in 1860.

Importance: Pineapple is one of the most important tropical fruits after mango, banana, and citrus. Fresh fruit production is a major industry in Central America and processed fruit in Asia.

Description

Plant

The pineapple is a herbaceous perennial with long sword-like leaves arranged in a spiral around a central stem and a terminal inflorescence. Leaves may or may not bear marginal spines depending upon variety and cultural practices. Adult plants may be 3 to 6 feet (0.9-1.8 m) high and wide.

Leaves

The leaves are sessile and whorled around a central stem. They increase in size toward the top of the plant. Individual leaves range in length from 2 to

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8 inches long (5-20 cm) for new plants and up to slightly more than 5 feet long (1.5 m) on mature, healthy plants. Leaves taper progressively toward the tip and end in a sharp point. Leaves may or may not have spines along their edges depending upon variety and growing conditions. The leaves are semi-rigid and allow the plant to collect water at the base of the leaves, where aerial roots may absorb water and nutrients. Once the plant has produced between 70 and 80 leaves it is ready to flower.

Inflorescence (Flowers)

The fruit peduncle (stem) and inflorescence develop from the apical growing point. The emergence of the inflorescence is called the red heart stage due to the reddish peduncle bracts at the base of the inflorescence. The inflorescence consists of from 50 to over 200 individual flowers and is capped by a crown of numerous short leaves (up to 150).

The individual flowers are hermaphroditic with three sepals and petals, six stamens and one pistil. The flower petals are white at their bases to violet-blue at their tips. Each flower is surrounded by a hairy bract.

Generally the first flowers open 50 or so days after flower induction and flowering continues for 20 to 40 days. Usually one to 10 flowers open daily beginning around midnight and close the following evening.

Pineapple plants are self-incompatible, meaning pollen from the same variety will not result in seed production and seedy fruit. However, growing several varieties next to each other and flowering simultaneously may result in seedy fruit. To prevent seed formation, either grow only one variety or induce flowering at different times.

Fruit

The fruit of pineapple is a seedless syncarp. A syncarp is a fruit derived from the fusion of many individual flowers into one fruit. The fruit consists of the fused ovaries, bases of sepals and bracts, and cortex of the central core. When fruit are mature (ready to pick), the individual fruitlets flatten and the peel color begins to change from green to yellow progressively from the base to the top of the fruit. Fruit may weigh up to 5 lbs (2.3 kg) or more. Ripe fruit have a yellow peel and pleasant aroma. The pulp is yellow to golden yellow, sweet, and juicy.

Varieties

There are numerous pineapple varieties, however, 'Smooth Cayenne' is one of the most common variety grown. Other varieties which may be difficult to find for planting include 'Red Spanish', 'Singapore Spanish', 'Green Spanish', 'Sugarloaf', and 'Queen'. There are many variants of these pineapple varieties. More recently several new varieties have been developed and released including 'Delmonte Gold' and 'MD2'.

Varieties.

- 'Red Spanish'. Not as widely available as 'Smooth Cayenne'. Leaves are spiny. Fruit weigh 2 to 4 lbs (0.9-1.8 kg) and have a pale yellow flesh with pleasant aroma. Fruit have a squarish shape.
- 'Smooth Cayenne'. One of the most widely grown varieties in the world. Leaves are about 3 feet long (0.9 m) with some spines at the base and top. Fruit weight 5 to 6 lbs (2.3-2.7 kg) and have a pale yellow to yellow pulp. Fruit are cylindrical in shape and with high sugar and acid content.
- 'Queen'. Not as widely available as 'Smooth Cayenne'. Leaves are spiny. Fruit weigh 2 to 3 lbs (0.9-1.4 kg) and have a golden yellow flesh, crisp texture and delicate mild flavor. Keeps well after ripening.
- 'Singapore Spanish'. Not as widely available as 'Smooth Cayenne'. Leaves are about 3 feet long with some spines near the tip. Fruit weigh 3 1/2 to 5 lbs 1.6-2.3 kg) and have a golden yellow flesh.
- 'Sugarloaf'. Sometimes called 'White Sugarloaf or 'Kona Sugar Loaf'. Leaves are smooth. Fruit weigh 5 to 6 lbs (2.3-2.7 kg) with a white flesh and edible core; cylindrical in shape.

Super sweet types. These new varieties may not be available from nurseries. There are a number of new super sweet pineapple varieties with various names including 'Del Monte Gold™ Extra Sweet' (also called MD-2), this new pineapple variety is very sweet and has a barrel-like appearance. The pulp has a deep gold/yellow color inside. 'Hawaiian Gold'™, 'Super Sweet'™ and 'Ultra Sweet'™ are other new super sweet varieties. These new varieties can be picked and shipped and retain good fruit quality.

Climate

Pineapple plants are best adapted to the warmest areas of Florida, along the southeast and southwest coasts. However, pineapple plants are grown in protected locations and landscapes throughout Florida. The time from planting to harvest depends upon the cultivar, cultural practices, and temperature; it ranges from 18 to 24 months.

Cool and Freezing Temperatures. Pineapple plants do not tolerate freezing temperatures below 28°F (-2.0°C), and temperatures below 60°F (15.5°C) and above 90°F (32°C) may slow plant growth. Optimum temperatures for pineapple growth range between 68°F and 86°F (20-30°C). Chilling injury caused by low, near freezing temperatures or light frosts may result in the upper leaf surfaces developing a red/white flecked, scorched appearance and pulp rotting of the fruit. Some protection may be obtained by covering outdoor pineapple plants with an insulating material such as blankets or mulch. Plants grown in containers may be taken inside.

Drought. Pineapple plants are tolerant of dry soil and weather conditions, however, plant growth and fruit production will be reduced. Symptoms of drought develop slowly but include wilting of the older leaves, leaf color change from dark to pale green, then yellow and red, and curling of the leaf margins.

Flooding. Pineapple plants are not very tolerant of excessively or continuously wet or flooded soil conditions. Generally, growth and production are reduced and susceptibility to root rot is increased, which may lead to plant death.

Wind. In general, pineapple plants are tolerant of windy conditions, although some reduction in plant growth and fruit stalk toppling may occur. Symptoms of wind stress include browning of the leaf tips and margins. Hurrican-force winds may cause toppling or uprooting.

Saline Conditions. Wind-borne salt spray results in blackish spots near the the tips of leaves.

Propagation

Pineapple are typically propagated from new vegetative growth from the original (mother) plant. There are four types of common planting material: the crown of the fruit; slips and hapas, which arise from the stalk below the fruit; suckers, which arise from the leaf axils of leaves; and ratoons, which arise from underground portions of the stem. The crown consists of the leaves and top 1/2 to 3/4 inches (13-19 mm) of the top of the fruit. Slips originate from the fruit stalk below the fruit and have a characteristic curve to the base of the leaves. Hapas are similar to slips but develop well below the base of the fruit and do not have the characteristic curve at the base of the leaves. Slips and hapas should be left on the peduncle for several weeks after harvesting the fruit in order to develop a usable size for planting.

Suckers develop along the bases of the leaves and also should be left on the plant after fruit harvest to develop usable size for planting. The central stem may also be used to propagate new plants and is usually cut into several pieces. In all cases, the larger the crowns, slips, hapas, suckers, and stem pieces, the more rapid the growth and time to fruiting after planting.

To start new plants, detach the slips, hapas, or crown from the original plant and let them air dry in the shade for a day or two. Plant in clean soil media in the prepared area of the landscape or in containers.

Production (Crop Yields)

Individual pineapple plants may produce up to two fruit (plant crop and ratoon crop). The ratoon (second) fruit is produced from a sucker that arises below the fruit and is allowed to grow. After

harvesting the first fruit (primary or plant crop), remove all suckers and hapas but one. This will then develop into the ratoon crop. Continuously harvesting and planting suckers, hapas, or crowns from the original plant will result in a continuous supply of new fruit. The time from planting to harvest of the fruit ranges from 18 to 36 months in subtropical climates.

Spacing and Pruning

Pineapple plants are an excellent choice for planting in home landscapes with little open space. In general, pineapple plants should be planted in full sun for best growth and fruit production. Select a part of the landscape at least 5 feet (1.5 m) away from other trees, buildings and structures where minimal shading occurs. The distance between individual pineapple plants ranges from 12 to 36 inches (21-91 cm). In general, wider spacing among plants allows for production of larger plants and fruit than close spacing among plants.

In cold areas, planting near structures will afford plants some cold protection during the winter, but it will slow plant growth. In general, plant growth, time to flowering, and fruit size and quality will be reduced if plants are grown in the shade.

Removing suckers, slips, and hapas during plant growth and fruit development will hasten the development of the fruit and increase fruit size. However, allowing a few suckers or slips or hapas to grow will supply new planting material. After the first fruit is harvested.

Soils

Pineapple plants grow best in moderately fertile, sandy loam soils of neutral to mildly acid pH. Plants will grow satisfactorily in sandy and calcareous soils with attention to watering and fertilizer. Pineapple should be grown in well-drained soils and areas of the landscape that do not flood.

Planting a Pineapple Plant

Proper planting is one of the most important steps in successfully establishing and growing a rapidly and productive pineapple plant. The first step is to choose a healthy nursery plant. Commonly, nursery pineapple plants are grown in 1- to 3-gallon (3.8- to 11-liter) containers and plants stand 6 inches to 2 feet (15-61 cm) from the soil media. Large plants in smaller containers should be avoided because the root system may restricted. Restricted root systems may not grow properly once planted in the ground. Inspect the plant for insect pests and diseases. Select a healthy plant and water it regularly in preparation for planting in the ground.

Site Selection

In general, pineapple plants should be planted in full sun for best growth and fruit production. Select a part of the landscape away from other trees, buildings and structures, and power lines. Remember, pineapple plants need full sun for best growth and production. Select the warmest area of the landscape that does not flood (or remain wet) after typical summer rains.

Planting in Sandy Soil

Many areas in Florida have sandy soil. Remove a 3- to 6- foot-diameter ring (0.9-1.8 m) or 2-foot by 6-foot rectangle (0.6- 1.8- m) of grass sod. To plant single plants, dig a hole 3 to 4 times the diameter and 2 times as deep as the container the pineapple plant came in. Making a large hole loosens the soil next to the new plant, making it easy for the roots to expand into the adjacent soil. For planting on a rectangular bed, excavate the soil to a depth two times the depth of the container the plant came in and form a bed of mounded soil.

It is not necessary to apply fertilizer, topsoil, or compost to the hole. In fact, placing topsoil or compost in the hole first and then planting on top of it is not desirable. If you wish to add topsoil or compost to the native soil, mix it with the excavated soil in no more than a 1:1 ratio.

Remove the plant from the container and place it in a hole so that the top of the soil media from in the container is level with or slightly above the surrounding soil level. Fill soil in around the plant roots and tamp slightly to remove air pockets. Immediately water the soil around the plant.

Planting in Rockland Soil

Many areas in Miami-Dade County have a very shallow soil, and several inches below the soil surface is a hard, calcareous bedrock. To dig a hole or make a bed, use a pick and digging bar to break up the rock, or contract with a company that has augering equipment or a backhoe. If you wish to add topsoil or well-decomposed compost to the native soil, mix it with the excavated soil in no more than a 50-50 ratio. Plant the plant as described for sandy soils.

Planting on a Mound

Many areas in Florida are within 7 feet (2.1 m) or so of the water table and experience occasional flooding after heavy rains. To improve plant survival, consider planting pineapple plants on a 2- to 3-foot-high by 4- to 5-foot-diameter (0.6-0.9 m by 1.2-1.5 m) mound or bed of native soil. After the mound is made, dig a hole two times the diameter and two times as deep as the container the plant came in. In areas where the bedrock nearly comes to the surface (rockland soil), follow the recommendations for the previous section. In areas with sandy soil, follow the recommendations from the section on planting in sandy soil.

Planting in a Container

Pineapple plants are well adapted to planting in a container. Choose a 3- to 7-gallon (11- to 26-liter) container with drainage holes. The larger the container, the greater the potential for a large plant and fruit; small containers restrict the size of the plant and resulting fruit size. Use a well-drained potting soil mix and fill the container to within an inch (2.5 cm) or so of the top. Water the soil before planting the plant (water should be seen draining from the drainage holes). Plant the pineapple in the center of the container and water in the plant well. Place the container in full sun for best growth. When the plant flowers and fruits, tie the stalk to a stake to prevent it from falling over. See the section on care of pineapple plants for further information.

Care of Pineapple Plants in the Home Landscape

A calendar outlining the month-to-month cultural practices for pineapple is shown in Table 1.

Fertilizer

Dry Mixes and Iron Soil Drenches. Dry fertilizer mixtures containing 6 to 10% nitrogen (N), 6 to 10% available phosphoric acid (P), 6 to 10% potash (K), and 4 to 6% magnesium (Mg) give satisfactory results with pineapple plants (Table 2). Young plants should be fertilized with 1 to 2 oz (30-29 g) or less of NPK every 8 weeks increasing the amount as the plant grows (Table 2). Plants growing in high-pH soils may be periodically fertilized with chelated iron material drenched around the base of the plant or sprayed with a liquid iron source.

Liquid Mixes. Pineapple plants may also be fertilized foliarly with mild solutions of nutrient mixes that include NPK and Mg (Table 1). Follow the directions on the label of the mixed material to avoid leaf burn. Iron may be a component of some foliar nutrient mixes, however; if the material does not contain iron, a 1% solution of ferrous (iron) sulfate may be applied foliarly. Apply foliar nutrients applications every 8 to 10 weeks (Table 2).

Micronutrient Mixes. Foliar sprays containing micronutrients such as zinc and manganese (iron is also sometimes a component) should be applied 2 to 3 times a year during the warm season. Follow the directions of the micronutrient mix material to avoid leaf burn.

Compost and Topsoil. A small amount of compost and/or top soil may be incorporated into the soil before planting. This will aid in root development and improve the water- and nutrient-holding capacity of the soil.

Irrigation (Watering)

Pineapple plants should be watered during extended dry periods for best plant growth and fruit production (Table 1). Excessively drained soil that holds little water should be watered once a week.

Pineapple and Lawn Care

Pineapple plants in the home landscape are susceptible to injury caused by lawn mowers and weed eaters. Maintain a grass-free area 2 to 5 feet (0.6-1.5 m) away from pineapple plants. Never hit the plant with lawn mowing equipment and never use a weed eater near the plant. Mechanical damage to the plant will weaken it, and, if severe enough, will severely reduce plant growth, cause dieback or kill the plant.

Roots of mature pineapple plants spread beyond the drip-line of the leaves, and heavy fertilization of the lawn next to the plant is not recommended because it may reduce fruiting and or fruit quality. The use of lawn sprinkler systems on a timer may result in over-watering and cause pineapple plants to decline. This is because too much water too often applied causes root rot.

Mulch

Mulching pineapple plants in the home landscape helps retain soil moisture, reduces weed problems next to the plant, and improves the soil near the surface. Mulch with a 2- to 6-inch (5- to15-cm) layer of bark, wood chips, or similar mulch material. Keep mulch 8 to 12 inches (20-30 cm) from the base of the plant.

Water-permeable ground cloth may also be used as a mulch to suppress weed growth among closely spaced pineapple plants. A thin layer of natural mulch may then be placed on top of this for aesthetic purposes.

Staking

Sometimes the weight of the fruit causes the fruiting stalk to bend or break. This may result in sunburn on the sides of the fruit; fruit will then not develop properly. Staking the fruiting stalk of the pineapple plant with a wooden or bamboo stake will prevent the stalk from toppling or bending to the ground under the weight of the fruit. However, do not use wire or nylon rope to tie the plant to the stake because they may eventually damage the plant as it grows. Use a cotton or natural fiber string that will degrade slowly.

Forcing (Flowering)

Research has shown that the larger the pineapple plant is when it flowers, the larger the potential fruit produced. Removing developing slips and suckers will enhance the rate of growth of pineapple plants and reduce the time it takes them to become large enough to induce flowering and produce large fruit.

Pineapple plants may be induced to flower by shortday lengths, cool/cold weather, and dry or drought conditions (Table 1). To produce the biggest and highest quality pineapple fruit, cultural practices prior to full plant size should be aimed at keeping the plant in an active state of vegetative growth. This may be accomplished by frequent light applications of fertilizer and periodic watering. Neglected plants and plants exposed to prolonged drought or cold may be induced to flower early and therefore produce smaller fruit.

Once the pineapple plant has matured, usually after 14 to 18 months from planting depending upon plant care and temperatures, it may be allowed to flower by exposure to cool temperatures or it may be induced to flower by application of a small amount (pea-sized) of calcium carbide dropped into the center of the rosette of leaves at the top of the plant (Table 1). The application of carbide should be made at night and it will react with water to release acetylene, which will induce flowering.

The time from flower induction to fruit harvest ranges from 5 to 7 months depending upon variety, weather, and cultural practices.

Insect Pests

Pineapple plants may be attacked by various mealybugs, scales, and root-feeding grubs of several beetle species. Prior to planting, inspect the pineapple plant (especially the undersides of the lower leaves) for mealybugs and scales; if needed treat for control and then plant.

Mealybugs. Mealybugs may attack the leaves and lateral, shallow roots, weakening the plant and decreasing fruit production. Ants commonly "farm" mealybugs and scales by protecting them from natural predators and moving them to new feeding

sites. Controlling ants will decrease the likelihood of mealybug infestations.

Scales. Scales attack the leaves of pineapple plants, which weakens the plant. To prevent scale infestations, use clean soil media to start new plants and inspect plants frequently.

Nematodes

Several nematodes may cause significant injury to pineapple roots including root knot (*Meloidogyne* spp.) and reniform (*Rotylenchulus reniformis*) nematodes. Symptoms include plant decline, stunted development and reduced fruit production. Plant only vigorous plant material. If possible inspect the roots for signs of nematode feeding before planting, and discard planting material with signs of infestation. The best control is not to introduce nematode-infested soil or plant material into the pineapple planting area.

Diseases

Pineapple root rots may be caused by various *Phytophthora* and *Pythium* species which attack and destroy the root system. Symptoms include a reduction in plant growth, development of reddish colored leaves, browning of leaf margins, and plant decline and death. Primary control is to use disease-free planting material and avoid long periods of excessive soil moisture. These rot-causing organisms may spread through the main stem and infect developing fruit as well.

Animal pests

Raccoons, squirrels, and opposums will sometimes feed on maturing pineapple fruit. To help prevent this, cover the developing fruit with a paper bag or newspaper.

Harvest, Ripening, and Storage

For optimum fruit sweetness, pineapple fruit should be harvested when 1/3 to 2/3 or more of the peel (called a shell) color has turned from green to yellow. Alternatively, fruit may be picked at a late mature green stage (fully mature, full size but not turning yellow) and allowed to ripen at room temperature. Complete ripening may then be allowed at room temperature (78-82°F; 26-28°C) before refrigeration. Generally, once it is ripe, fruit may be held in the refrigerator for up to a week before use. Immature (green fruit) should not be placed in the refrigerator because this may cause chilling injury and the fruit will not ripen properly.

Uses and Nutritional Value

Pineapple may be used fresh, juiced, dried, made into candies, and incorporated into cooked dishes and desserts. The fruit is a good source of potassium, vitamin C and vitamin A (Table 3).

Table 1. Pineapple fertilizer recommendations.

Operation	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Strategy	First 14 to 16 months: Concentrate on growing a vigorous, healthy pineapple plant for the first 14 to 16 months. Fertilize in small amounts frequently (every 6 to 8 weeks) and water during dry periods. After 16 months, induce flowering or allow winter cool period to induce flowering; reduce nitrogen fertilizer rate. Once flowering occurs, continue to fertilize and water plants to enhance fruit growth and quality.											
General dry[1]	Apply NPK mix		Apply NPK mix		Apply NPK mix		Apply NPK mix		Apply NPK mix		Apply NPK mix	
General foliar [1]	Apply NPK foliar mix		Apply NPK foliar mix		Apply NPK foliar mix		Apply NPK foliar mix		Apply NPK foliar mix		Apply NPK foliar mix	
Foliar micronutrients[2]					Apply spray		Apply spray		Apply spray			
Iron applications [3]	Apply iron		Apply iron		Apply iron		Apply iron		Apply iron		Apply iron	
Watering	Water during dry periods lasting more than 6 or 7 days during hot weather and every 10 or 12 days during the cooler winter months.											
Insect control	Monitor for scales and mealybugs. Contact your local County Extension Agent for current control measures.											
Disease control	Monitor for plant decline and diseases. Contact your local County Extension Agent for current control measures.											
Flower forcing			Allow flowering to occur after cool weather or induce flowering now.									

[1] Use either a dry fertilizer mix or foliar mix or alternate, e.g., dry, foliar, dry, foliar, etc.
[2] Use complete micronutrient fertilizer mixes that may contain manganese, zinc, and iron (some mixes may have magnesium).
[3] Apply a foliar mix of iron (ferrous) sulfate or soil drench of chelated iron.

Table 2. Suggested fertilizer recommendations for pineapple in Florida.

Month	Amount for dry NPK (oz)[z]
1-3	1-2
4-6	1-3
6-12	2-6
12-16	3-6
17-24	5-8

[z] Use the lower rate for higher analysis (e.g., 10-10-10) fertilizer materials.

Table 3. Nutrient content of 100 g (3.5 oz) of fresh pineapple.[z]

Constituent	Approximate value	Constituent	Approximate value	Constituent	Approximate value
Water	87%	Carbohydrate	12.6 g	Phosphorus	8 mg
Calories	48 kcal	Fiber	1.4 g	Potassium	115 mg
Protein	0.54 g	Calcium	12 mg	Sodium	1 mg
Fat	0.12 g	Iron	0.28 mg	Vitamin C	36 mg
Cholesterol	0 g	Magnesium	12 mg	Vitamin A	56 IU

[z] USDA National Nutrient Database for Standard Reference, Release 18 (2005). [Website: http://www.nal.usda.gov/fnic/foodcomp/search/] [Accessed, November 5, 2005].