



## The Papaya<sup>1</sup>

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- **Scientific Name:** *Carica papaya*
- **Family:** Caricaceae
- **Origin:** Tropical America

### HISTORY AND DISTRIBUTION

The papaya was first described by the Spanish chronicler Oviedo in 1526 from the Caribbean coast of Panama and Colombia. It was soon grown throughout the tropics, its distribution undoubtedly being aided by an abundance of seed of relatively long viability (up to 3 years under cool, dry conditions). It has become naturalized in many tropical regions, particularly in areas with fertile soils and abundant rainfall.

### DESCRIPTION

Papayas are giant herbaceous, dicotyledonous plants which may produce fruit for more than 20 years. When cultivated, plants usually have a single trunk, but several branches may develop as the plants become older. Trees growing in fertile, well drained soils with sufficient moisture may reach a height of 30 feet or more. The grayish trunk is marked by characteristic large leaf scars and has soft, pulpy wood. The large, deeply lobed leaves, sometimes reaching 3 feet across, have hollow, soft petioles 2 feet or more in length. The melon-like fruit varies

considerably in size and shape, and hangs from short, thick peduncles at the leaf axils.

The papaya is a polygamous species. The plants may be classified into three primary sex types: 1) male (staminate), 2) hermaphroditic (bisexual), and 3) female (pistillate). In addition, some plants can produce, at the same time, more than one kind of flower. Also, some produce flowers which are not of these basic forms, but exhibit different degrees of maleness and femaleness. This tendency to change in sexual expression seems to be triggered by climatic factors, such as drought and variable temperatures. The tendency to produce male flowers seems to increase at high temperatures.

Since male trees are unfruitful and fruit from bisexual plants is preferred in some markets, it is very important to select seed which will give a maximum number of fruitful trees of the desired type. This cannot be done by simply saving seed from productive open-pollinated plants, but one can predict fairly accurately the progeny by knowing the source of pollen and the kind of flower the fruit came from. Accordingly, the grower must hand pollinate to obtain the desired combination of flower types. This is done by covering an unopened flower, either bisexual or pistillate, with a paper bag until it opens and then transferring the desired pollen onto the receptive pistil. Pollination studies have shown that: 1) pistillate flowers pollinated by staminate flowers give

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equal numbers of male and female progeny; 2) pistillate flowers pollinated by pollen from bisexual flowers give an equal number of female and bisexual progeny, 3) bisexual flowers either selfed or crossed-pollinated with other bisexuals give a ratio of one female to 2 bisexual, 4) bisexual flowers pollinated by staminate ones produce equal numbers of female, male and bisexual progeny. It is evident that the second and third combinations will produce the maximum number of fruit-bearing plants.

### CLIMATE

The papaya thrives best under warm conditions with abundant rainfall or irrigation. It cannot tolerate strong winds, flooding, or frosts, and it recuperates very slowly if it has sustained considerable leaf or root injury. Temperatures of 30°F or lower usually cause severe damage or death.

### PROPAGATION AND PLANTING

Vegetative propagation is not practical, although it may be desirable to preserve good selections. Both grafting and rooting of cuttings are easily accomplished but are too laborious to justify their commercial use. In contrast, seeds are produced abundantly and germinate readily (in 10 to 15 days) and uniformly. Under suitable growing conditions fruit can be harvested in 8 to 10 months. Seeds should be obtained from ripe fruit, washed to remove the gelatinous aril, planted in small pots, and germinated under full sunlight. Peat pots are ideally suited for this, since they can be set directly in the field without removing the plants from individual containers. Two to three seeds are sown per pot to compensate for low germinations, damage by insects, and removal of male plants. Planting distance depends on soil fertility, irrigation facilities, and location. The home owner should space his plants 8 to 10 feet apart. The use of machinery in commercial operations requires rows to be 12 to 15 feet apart, but plants should be 6 to 8 feet apart in the row. Seedlings are set in the field when 6 to 8 inches tall. They begin flowering after 5 months, and only one vigorous bisexual or female plant is allowed to grow, in each site all others being removed.

In south Florida, if plants are set in the field in February or March, it is possible, with good care, to harvest fruit in October or November. This requires starting seedlings in a greenhouse or under plastic, and protecting them against frosts by heating or sprinkler irrigation. In cooler areas of the state, May

and June are better months for field planting, and good yields cannot be expected before the following April or May.

### CULTIVATION

To grow papayas successfully, the grower should make sure that the following requirements are met.

1. The seed should preferably come from controlled crosses (female x bisexual or bisexual selfed), or from bisexual trees known to have a high degree of self-pollination under field conditions. The type of seed used is most important since it determines production potential and thus restricts or enhances the value of other cultural methods.
2. The soil should have good drainage. Papayas are very sensitive to even short periods of flooding. If not killed, they lose their vigor and regain it very slowly.
3. Irrigation should be provided during dry spells because a fluctuating water supply may cause growth retardation, flower abortion, and dropping of young fruits.
4. Papayas are fast growing plants which require an abundant supply of nutrients if they are to be highly productive. Supplemental fertilization is particularly important in infertile soils. Nitrogen and phosphorus are especially important. In Florida, young plants should be started with ½ lb of a 10-10-10-5 mixture (with 30% of the nitrogen from natural organic sources) at planting time or shortly after. This amount of fertilizer is applied every 2 weeks and should be increased gradually to 1½ lb until the plants are 7 to 8 months old. Thereafter, monthly applications should be sufficient, unless unusually hard rains occur. Fertilizer should be reapplied under these conditions.

### CULTIVARS

Because of its complex genetic make-up, there are few, if any, true cultivars of papaya which are as uniform in horticultural characters as the cultivars of other herbaceous crops. When seed results from open pollination, it is impossible, in most cases, to obtain selections which are reasonably uniform in flower type and fruit characteristics. Despite the lack of recognized cultivars, growers can maintain satisfactory strains by controlled pollination of

selected plants as described under Propagation. Parent plants should be carefully selected for early and heavy fruit production and should have fruit of desirable shape and size.

A group of Hawaiian papayas referred to as Solo comes closer to deserving cultivar rank than any other types. Originally from Barbados (W. I.), Solo owes its constancy in character expression to a high degree of natural self pollination of its bisexual flowers. This, in addition to continuous selection of pear-shaped fruit produced by bi-sexual plants, has maintained Solo relatively unchanged over the years. Improved selections, such as Sunrise Solo, have resulted from rigorous breeding work. Unfortunately, the Solo group is not well adapted to Florida conditions.

### **INSECTS, DISEASES, AND NEMATODES**

There are three insect pests of papaya which can occasionally be damaging in Florida. In order of importance they are: 1) papaya fruit fly (*Toxotrypana curvicauda*), the larvae (maggots) feed on the seeds and interior tissues of the fruit. 2) papaya webworm (*Homolalpalpia dalera*), the worms produce a web around the fruit and stem and feed on the tissue under the web. 3) papaya white fly (*Trialeuroides variabilis*), adults and immature stages of this sucking insect feed on the underside of the younger leaves. Sooty mold, a black mildew, which grows on the excretions of the whitefly, is often associated with infestations.

The major fungus diseases in Florida are: 1) Anthracnose (*Colletotrichum gleosporiodes*), together with other fungus rots, may cause considerable spoilage of the fruit, particularly during rainy weather. 2) Powdery mildew (*Oidium* spp.) is recognized by the whitish mildew growth on leaves and on stems of seedlings and can be troublesome during the winter and spring. For more information and current control recommendations, please contact your local County Agricultural Extension Agent.

Nematodes, such as root-knot, can be very damaging to papayas, particularly in sandy soils. Since effective chemical control is difficult and very costly, the homeowner should try preventive measures such as rotating planting sites, or maintaining plants in the most vigorous condition possible. Mulching helps plants withstand nematode attack under some conditions.

### **VIRUS DISEASES**

These are, in many areas, the single most important factor limiting papaya production. Papaya ringspot virus is the most damaging in Florida, although mild mosaic and faint mottle ringspot have also been reported. Symptoms are varied but include mottling, distortion, and stunting of leaves and greasy-appearing rings and spots on the fruit. Diseased plants lose vigor and fruit production is reduced.

There is no control for virus diseases. The removal of diseased plants is helpful when incidence is low, but it only delays rather than controls the spread of the disease. The grower should learn to live with them by trying to obtain, through cultural methods, the fastest growth and maximum production before plants become infected. Vigorous plants withstand virus infections better and may even produce a fair crop of fruit.