

The Arabica and Robusta Coffee Plant

Coffee Plant Overview

The coffee bean plant is a woody perennial evergreen dicotyledon that belongs to the *Rubiaceae* family. Because it grows to a relatively large height, it is more accurately described as a coffee tree. It has a main vertical trunk (orthotropic) and primary, secondary, and tertiary horizontal branches (plagiotropic).

The Difference between Arabica and Robusta Coffee Beans

While there are several different coffee species, two main species of coffee are cultivated today. *Coffea arabica* known as Arabica coffee, accounts for 75-80 percent of the world's coffee production. *Coffea canephora*, known as Robusta coffee, accounts for about 20 percent and differs from the Arabica coffees in terms of taste. While Robusta coffee beans are more robust than the Arabica plants, they produce an inferior tasting beverage with a higher caffeine content. Both the Robusta and Arabica coffee plant can grow to heights of 10 meters if not pruned, but producing countries will maintain the coffee plant at a height reasonable for easy harvesting.



Coffee Plant Growth and Development

Three to four years after the coffee is planted, sweet smelling flowers grow in clusters in the axils of the coffee leaves. Fruit is produced only in the new tissue. The *Coffea arabica* coffee plant is self-pollinating, whereas the Robusta coffee plant depends on cross pollination. About 6-8 weeks



after each coffee flower is fertilized, cell division occurs and the coffee fruit remains as a pin head for a period that is dependent upon the climate. The ovaries will then develop into drupes in a rapid growth period that takes about 15 weeks after flowering. During this time the integument takes on the shape of the final coffee bean. After the rapid growth period the integument and parchment are fully grown and will not increase in size. The endosperm remains small until about 12 weeks after flowering. At this time it will suppress, consume, and replace the integument. The remnants of the integument are what make up the silverskin. The endosperm will have completely filled the cavity made by the integument nineteen weeks after flowering. The endosperm is now white and moist, but will gain dry matter during the next several months. During this time the endosperm attracts more than seventy percent of the total photosynthates produced by the tree. The mesocarps will expand to form the sweet pulp that surrounds the coffee bean. The coffee cherry will change colour from green to red about thirty to thirty-five weeks after flowering.

Coffee Plant Root System

The roots of the coffee tree can extend 20-25 km in total length and the absorbing surface of a tree ranges from 400 to 500 m². There are main vertical roots, tap roots, and lateral roots which grow parallel to the ground. The tap roots extend no further than 30-45 cm below the soil surface. Four to eight axial roots may be encountered which often originate horizontally but point downward. The lateral roots can extend 2 m from the trunk. About 80-90% of the feeder root is in the first 20 cm of soil and is 60-90 cm away from the trunk of the coffee tree. However, the greatest root concentration is in the 30 to 60 cm depth. The roots systems are heavily affected by the type of soil and the mineral content of the soil. To be thick and strong, the coffee roots need an extensive supply of nitrogen, calcium and magnesium. During planting the main vertical roots are often clipped to promote growth of the horizontal roots, which then have better access to water and added nutrients in the top soil.

Coffee Leaves

The elliptical leaves of the coffee tree are shiny, dark green, and waxy. The coffee bean leaf area index is between 7 and 8 for a high-yielding coffee. The coffee plant has become a major source of oxygen in much of the world. Each hectare of coffee produces 86 lbs of oxygen per day, which is about half the production of the same area in a rain forest.

Growing Coffee Beans at Home

Growing coffee plants at home is a rewarding experience that will help you learn and appreciate the work involved in producing coffee. It is a very easy plant to take care of and is a great conversation piece, especially during flowering or cherry development

When home growing coffee beans, you should start with a freshly picked coffee cherry. But unless you are in a producing country, however, this may not be possible and you can skip to section 2.

For more information about growing *Coffea arabica* successfully at home, go to the about home website at <http://houseplants.about.com/od/Tropicals/p/Coffee-Growing-Coffee-Plants.htm>.



Harvesting Coffee and Preparing the Coffee Seeds

Ripe coffee cherries should be harvested and picked from trees with a high production and without any disease or other affliction. Pulp the cherry by hand, wash with water, and ferment in a small container



until the pulp falls off. This can be determined simply by rubbing the coffee bean in your hands during the fermentation process. Wash again with fresh water. Any coffee beans that float at any stage of washing should be discarded. The coffee beans must then be dried to about 20% moisture content on mesh screen in open and dry air, but not in direct sunlight. After pulping, a coffee will have between 60-70% moisture content so you can determine the appropriate stopping point simply by weighing the beans. Otherwise, you can bite the bean open to ensure that it is dry on the outside and slightly

soft and moist on the inside. Alternatively, a pulped coffee bean can be used immediately for planting and in some areas this is considered advantageous.

Germinating Coffee Beans

If coffee cherries are not readily available, green coffee can be purchased from a green coffee supplier, but it is essential that the bean is of a recent crop and recent shipment.

The potential for germination will continue for almost four months, but after this time the germination rate is several fold less and germination time is significantly longer. Fresh seeds should germinate in 2.5 months, but old seeds can take as long as 6 months.

It is advisable to pre-germinate the seeds. First soak the coffee seeds in water for 24 hours. Then sow the seeds in damp sand or wet vermiculite in which the excess water has been drained. Otherwise, you can place the seeds between moist coffee sacks, which should be watered twice a day and drained well.

Once the coffee seed germinates, very carefully remove it from the sand, vermiculite, or burlap bags. Make a hole about 1.25 cm deep in a friable loam soil with a high humus content. Rotted manure, bone meal, and dried blood can also be added. If this type of soil is not readily available try a light weight and porous soil. Place the seed flat side down in the hole and sprinkle soil over the hole. Do not press the soil down firmly. Placing a 1/2 inch of mulched grass on top will help preserve moisture, but should be removed when the seed has fully germinated.

The seeds should be watered daily. Too much water or too little water will kill the seed. The soil should remain well drained, but moist at all times.

After germination, the coffee plant should either be left alone or carefully removed and planted in a soil with a low pH (acidic) and high nitrogen content. The soil should be porous. Therefore, coarse sand or basalt gravel dust can be added. Manure can also be added. A fertilizer that is appropriate for orchids can be used sparingly for the coffee plant to maintain mineral levels and a low pH.

Coffee Plant Care

The coffee plant thrives under artificial plant lighting indoors. The outside temperature in countries outside the Tropic belt is too volatile and too cold to allow the tree to develop. Water the tree twice per week in what is called a full watering and a half watering. In a half watering, simply add some water to the soil and allow it to drain. In a full watering, add water, allow it to drain, and then add water with fertilizer and allow it to drain. The key is to keep the soil moist, but well drained.

After two or three years flowering and possibly cherries can be expected, but do not expect high-quality coffee unless you are at a high altitude and are monitoring the conditions of the artificial microclimate carefully. For more coffee growing details please see the rest of the agriculture section. In theory, it is feasible to grow a high-quality coffee at home under the right conditions.

To spur flowering, wait until the beginning of winter and significantly reduce watering for 2-3 months. When spring begins, water the plant well, which should shock it into producing flowers. From this point forward, water well and regularly. Arabica coffee is self-fertilizing so you will not need to worry about pollinating.

Once the cherries mature you can harvest, pulp, ferment, dry, roast, and drink the coffee.