


The Tea Plant

By Carolyn N. Porter

The tea plant (*Camellia sinensis*) is one of about 80 species of East Asian evergreen shrubs and trees that belong to the tea family, or Theaceae. Tea reaches a height of 9 meters but is kept pruned to a low, mounded shrub in cultivation. The foliage is emerald green, while the flowers are fragrant, yellow-centered, white and about 4 centimeters wide.

History

Tea plant cultivation began about 4,000 years ago in its native country, China. The Japanese did not discover the plant until the 8th century A.D., and cultivation was established by the 13th century. The Europeans were finally introduced to the plant during the 17th century. And, by the late 19th and early 20th centuries, tea growing had spread to Russian Georgia, Sumatra, Iran, and non-Asian countries such as Natal, Uganda, Kenya, Congo and other African countries and also to Argentina, Brazil, and Peru in South America and even to Queensland in Australia. Americans invented tea bags, and at the St. Louis World's Fair in 1904, they started the practice of drinking iced tea (Algood, 1999).

The date as to when the Chinese discovered that the leaves of the tea plant could be turned into a beverage precedes written history. However, an accepted story dates the discovery to 2737 B.C. when Emperor Shen Nung drank hot water containing leaves of a camellia species that accidentally fell into it (Durbin, 1999).

For millenia, tea was used as a medicinal beverage because it flavored water and seemed to help prevent sickness, It became a daily beverage around the 3rd century A.D. When the tea trade began, it was transported around China and beyond its borders by caravans consisting of 300-500 horses. The men leading the horses discovered that a tasty orange fluid would come running out of the bags once they became wet. The workers started to drink tea (Durbin, 1999).

Before World War II, Americans primarily drank green (unfermented) and oolong (semi -fermented) teas. The colonists dumped green tea into Boston Harbor during the Boston Tea Party. Black

(fermented) tea did not become popular until after the war (Hansen, 1998), and today it is the most popular type in the U.S.

Cultivation

The tea plant blooms in early fall. It is very hardy and can survive temperatures as low as 0 degrees F, but cool seasons that differ by 20 degrees F from the warm season will cause the growth rate of the plant to decrease and a dormant period will set in. Camellias thrive in moist, well-drained, slightly acidic soils and prefer partial shade. A suitable climate has a minimum annual rainfall of 45-50 inches. During the growing season, the plant is kept pruned to a short bush because only the young, tender leaves and buds are wanted for commercial processing into marketable tea.

Camellias can be propagated from softwood cuttings rooted under mist or from seeds. Seed propagation requires no pretreatment, and grafting selected scion wood onto large root stock speeds early growth and promotes early flowering of young plants.

As with all crop plants, the tea plant is subject to a host of pests and diseases. At least 150 different insect species and 380 fungus diseases attack *camellia* (Eden, 1976). However, blight control has become highly developed and 40 different pesticides exist. As with all pesticides, some do have setbacks. For example, some cannot be applied during the season of harvest and some require that after application, the two subsequent rounds of pluckings be discarded.

Processing

The flavor of tea is determined by how the tea leaf is processed, by the size of the leaves, and by blending, Processing any tea involves some or all stages of withering, rolling, fermenting, and drying. The three types of tea are black, green, and oolong

The withering stage is initiated by the actual plucking of the leaf. Harvest of best teas are still done by hand because machine picking can damage leaves, and only the top two leaves and final bud are used. Traditionally, after plucking, the fresh leaves are spread by hand into thin layers on trays called *tats*. The *tats* may simply be sections of coarse fabric. The leaves are then left to wither in the sun. This makes the leaf limp or flaccid due to water loss. Open air withering has been replaced by a variety of mechanized systems. These mechanized systems greatly reduce withering time but may lower the quality of the final product.

After withering, the leaves are rolled. At this stage, the leaf is distorted and bruised to break open their leaf cells. The traditional method of rolling was done by rolling bunches of leaves between the hands or on a table. Now, leaves may be machine-rolled or cut. Some modern distorting machines burst the leaf cells so thoroughly that the withering stage is no longer necessary. These machines, however, do not produce the larger leafy grades of teas.

Next, the leaves are again spread out and left in a warm place to "ferment," The fermentation stage actually begins when the leaf cells are broken during rolling. This type of fermentation is a series of chemical reactions where the enzymes act on the tannin and natural oils in the leaves. During fermentation, the leaf color deepens and flavor develops. In traditional processing, optimum fermentation is reached after two to four hours.

Fermentation is stopped by heating or firing. This firing also preserves the leaves. Traditional firing was done on large pans or screens over fire, but now a drier that blows heated air into a chamber is used. In the drier, the leaves are cooled quickly to prevent overdrying and loss of quality.

Black tea is the most popular type in the United States. Black teas are processed the longest and have a rich, reddish brown color and full aroma and flavor. Some well known types of black tea are Orange Pekoe, Darjeeling, and English Breakfast.

Green tea is unfermented tea. The leaves are steamed immediately after harvest to prevent fermentation and maintain pliability. The leaves are then rolled and fired until they turn dark green. They are then dried and either crushed into small pieces or ground to a powder. Green teas have a pale color and less aroma and flavor than black teas. Tencha and Gunpowder are a couple of the more popular green teas.

Oolong tea is semi-fermented. The leaves are briefly withered; then lightly rolled by hand until they become red and fragrant. They are then fermented for about onefourth the time of black tea and steamed to stop the process. They yield a tea that is in between the flavors, colors, and aromas of green and black teas. The best known oolong tea is Formosa Oolong from Taiwan.

Packaging

After the tea is processed, it must be packaged. The tea is first graded by particle size, shape, and cleanliness. Since small-sized teas are in demand, some larger teas are processed again to gain a higher amount of smaller grades. Hand or mechanical extractors pick out undesirable pieces of stalk and "winnowing" by air removes dust and tiny particles.

Processed tea must be packed into airtight containers to prevent absorption of moisture, Moisture absorption is the principal cause of loss of flavor during storage. Blended teas may be sold as loose tea or put into tea bags. Tea bags are usually packed with broken-grade tea.

Instant tea is a powdered form of brewed black tea. During processing, liquor is extracted and collected from tea wastes, processed leaves or undried, fermented leaves. Then the liquor is freeze-dried or vacuum-dried and granulated. Instant tea dissolves quickly in water and often contains sugar, sugar substitutes, and other flavors like lemon, orange, raspberry, peach or cinnamon. Instant teas are popular in the United States because they are suitable for iced tea which makes up 80% of U.S. tea consumption (Sachdev, 1997).

Medicinal Value

The majority of today's medical research involving tea is linked to green tea, but new studies are being conducted to include black tea. The Chinese have always believed that tea has strong medicinal uses. One Chinese proverb says, "The wisdom of 10,000 universes can be found in a cup of tea" (Byrn, 1997). Emperor Shen Nung presumably said, "Tea gives you vigor of body, contentment of mind and determination of purpose" (Durbin, 1999). Through research, tea has been linked to the reduction of the risk of cancers, artherosclerosis, and heart disease because of its strong antioxidant properties. One study compared tea extracts to the antibiotics amoxicillin, cephradine, and eugenol because the extracts strongly inhibited *Escherichia coli*, *Streptococcus salivarius*, and *Streptococcus mutans* on dental caries (Rasheed, 1998).

Tea derived from *Camellia sinensis* contains polyphenols, also called tannins, and small amounts of theophylline. Polyphenols, which account for more than 35% of tea's dry weight, are secondary metabolites shown to have excellent free-radical scavenging properties. The properties of these polyphenols make them effective chemopreventive agents against the initiation, promotion, and progression stages of multistage carcinogenesis (Katiyar, 1997).

Theophylline is an alkaloidal drug used in medicine as an anti-asthmatic, coronary vasodilator, and diuretic. Theophylline is administered orally and rectally to treat asthma. It facilitates breathing by relaxing the bronchioles in the lungs. It is given by injection to treat congestive heart failure, and orally to act as a diuretic by inhibiting reabsorption in the kidney tubules. Most theophylline is chemically synthesized, but potential exists for the use of natural theophylline.

The mechanisms of tea's broad cancer chemopreventive effects are not yet completely understood. However, frequent consumption of green tea enables the body to maintain a high level of tea polyphenols so regular tea consumption can help protect against various types of cancers and other various types of oxidative stress. Also, green tea has an antioxidant potency six times greater than black tea in in vitro tests but black and green teas exhibit similar properties in the body (Leigh, 1997).

Tea Traditions

Ritual tea drinking originated in China but was first practiced in Japan between 1192 and 1133 A.D. Zen monks would drink tea to keep themselves awake during long sessions of meditation (Britannica Online). During the 15th century, it came to be a gathering of friends to discuss the aesthetic attributes of art in private. This then developed into the tea ceremony.

The Japanese *Chado* or *Sado* (Way of Tea) is a ceremony rooted in the principles of Zen Buddhism and based on the love for the daily routine of life which Zen Buddhists describe as beautiful. The ceremony takes place in a tea house (*cha-shitsu*) which is a small structure separate from the house. The *cha-shitsu* consists of a small sunken fireplace used to heat water in the winter months and an alcove called a *tokonoma*. The *tokonoma* is where the art, calligraphy, and flower arrangements to be discussed are

placed. The entry to the *cha-shitsu* is a small, low door built to suggest humility to the guests.

The tea ceremony is supposed to emphasize harmony between the guests and implements used, respect among the participants and for the utensils, cleanliness, and tranquillity. Cleanliness is derived from the tradition requiring participants to wash their hands and rinse their mouths as symbolic gestures of cleansing before entering the *chashitsu*. Tranquillity is symbolized by the great care with which the utensils are used during the ceremony.

The host first brings tea utensils into the room. Then the host offers the guests sweets and serves a tea called *kolcha*. Sometimes a light meal precedes the serving of sweets and the tea. After the tea is gone, the guests ask about the various utensils and artwork. The ceremony concludes when the conversation ends and the implements are carried from the room.

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