Botanical Information of Tea

- **Camellia sinensis** is the source of tea of commerce. The young processed leaves yield tea - the world's most important caffeine beverage.

- **Plant**: Tea plants are evergreen, medium sized shrubs (4-6 ft.).

- **Blooming Time**: Flowers are solitary in the axils of the leaves. The flowers are white, middle yellow & 1 ½ inches in diameter and are fragrant.

- **Propagation**: *Camellia sinensis* are propagated by cutting or seed.
History of Tea

2737 BC - An early emperor in China, Shen Nung who was a skilled ruler and creative scientist accidentally discovered tea.

618 – 906 AD - Tang Dynasty. Powdered tea became the fashion of the time. Nobility made it a popular pastime. Caravans carried tea on the Silk Road, trading with India, Turkey and Russia.

805 - The Buddhist monk Saicho brought tea seeds to Japan from China.

1657 - Tea was first sold in England at Garway’s Coffee House in London. The East India Company operated out of several sites in the City of London.

1706 - The first auction dedicated to tea took place in Craven House, which became known as East India House.

1710 - Wealthy American Colonists developed a taste for tea.

1776 - China was the main tea source of eighteenth century. Ceylon, Central and Eastern African countries were sending teas to the London Auction.

Ecological Requirements of Tea

- Tea requires a moderately hot and humid climate.

- Rainfall: The average annual rainfall of 2000 mm is required. However, more than the total amount, the distribution of rainfall matters a lot for sustained high yield of tea throughout the season.

- Temperature: the ambient temperature within 13°C and 20°C is conducive for growth of tea.

- Soil: Tea grows well on high land well drained soils having a good depth, acidic pH in the range 4.5 to 5.5 and more than 2% organic matter.
Tea Manufacture

- **Leaf harvest & Transport** - An average plucking standard should have ideally about 75% fine leaf by weight comprising bud and two leaves.

- **Withering** - The first processing step in the factory and is a process in which freshly plucked leaf is conditioned physically, as well as, chemically for subsequent processing stages.

- **Rolling** - The withered leaf is charged in the rollers which vary in size. Various enzymes and their substrates come in contact and enzymatic oxidation starts at this stage. The green colour of leaf starts diminishing and brown coppery colour of leaf begins to appear. There are two methods;
  - **Orthodox process** - In the orthodox process of manufacture disruption of the leaf cells is carried out in a Rolling Table. During rolling juice from the leaf is wrung out and the leaf is also twisted and broken into smaller particles.
  - **The CTC (Crush, Tear, Curl) Process** - The CTC process achieves the three actions of Crushing, Tearing and Curling in the same machine at one go. Instead of working on large volumes of leaf, the CTC takes a fast, thin, but steady stream of leaf to pave the way to continuous processing in place of the batch mode of orthodox rollers.

Tea Manufacture

- **Fermentation (Oxidation)** – The process objective is to allow intimate contact of the catechins with the respective enzymes, which oxidize these catechins in presence of oxygen. Oxidation of catechin / polyphenols by the enzyme polyphenol oxidase is the main reaction of the process that imparts ‘tea character’ to the black tea.

- **Drying** - Fermented leaf is loaded onto the dryer, which comprises perforated moving trays. Thickness of spread, speed of trays and volume of air blown through are regulated to achieve the correct drying.

- **Sorting** - The bulk tea is sorted on mechanically oscillated sieves. The sieve size decreases gradually from top to bottom.

On an average 100 kg of fresh leaf produces 22.5 kg of dried tea containing residual 3% moisture.
Types of Tea

- **BLACK TEA**: leaves are fully fermented.

- **OOLONG TEA**: leaves are partially fermented. The same process applied to black tea applies, but the fermentation time is substantially shortened.

- **GREEN TEA**: leaves are not fermented at all. The leaves are heated immediately after picking to prevent fermentation. The leaves are then rolled, dried, and packed. Enzyme killed by placing in boiling water.

- **WHITE TEA**: steamed and dried almost immediately after harvesting.

- **SCENTED TEA**: Scented tea, which is very popular in Northern China, in fact is a mixture of green tea with flower petals of rose, jasmine, orchid and plum through an elaborate process. Among this type, jasmine tea is common.

Further Classification of Tea

- Other tea terms describe the size and age of tea leaves:
  
  Larger leaves are referred to as Orange Pekoe (OP), Pekoe(P).
  
  Smaller, broken leaves can be designated as Broken Orange Pekoe (BOP), Broken Orange Pekoe Fannings (BOPF), and fines ("tea dust")

- Similar terms describe leaf's age: from youngest to oldest - Flowery Pekoe, Orange Pekoe, Pekoe etc.

**Silver Tips**
All silver tip teas are manufactured only from buds that are picked during a period of 3 to 4 days just before the beginning of the main plucking season. The silver tips brews a fine silvery color infusion with lots of delicate aroma and wonderful taste.

**Golden Tips**
A rare tea out of Sri Lanka. Uses only buds with a golden tint. Brews an outstanding cup full of delicate flavor and wonderful taste. A rare tea only available in this limited quantity every year.
World Tea Production 2003

INDIA 29%
CHINA 26%
SRI LANKA 10%
KENYA 10%
ARGENTINA 5%
INDONESIA 6%
TURKEY 5%
VIETNAM 3%
JAPAN 3%
BANGLADESH 2%
MALAWI 1%
UGANDA 1%

World Tea Export 2003

SRI LANKA 22%
KENYA 20%
CHINA 20%
JAPAN 13%
INDIA 11%
ARGENTINA 8%
MALESIAN 7%
VIE T NAM 4%
BANGLADESH 3%
TURKEY 1%
IRA N 1%
JAPAN 0%
Annual Imports of Tea for Consumption

- **RUSSIAN FEDERATION**: 20%
- **UNITED KINGDOM**: 14%
- **PAKISTAN**: 14%
- **USA**: 11%
- **EGYPT**: 6%
- **JAPAN**: 5%
- **DUBAI**: 6%
- **AFGHANISTAN**: 5%
- **POLAND**: 4%
- **SYRIA**: 3%
- **RUSSIAN FEDERATION**: 20%
- **UNITED KINGDOM**: 14%

*CEYLON TEA*
CEYLON TEA

- The tea sector in Sri Lanka has always been a vital component of her economy. It is also one of the largest employer providing employment both directly and indirectly to over one million people. It also contributes a significant amount to Government revenue and to the gross domestic product.

- Sri Lanka as the 3rd biggest tea producing country globally, has a production share of 10% in the international sphere, and one of the world’s leading exporters with a share of around 22% of the global demand. The total extent of land under tea cultivation has been assessed at approximately 187,309 hectares.

History of CEYLON TEA

- 1824 - A tea plant was brought to Ceylon by the British from China and was planted in the Royal Botanical Gardens, Peradeniya. (non commercial)
- 1867 - James Taylor planted the first 19 acres of tea in Loolekandura Estate near Kandy, Ceylon and this marked the birth tea industry in Sri Lanka.
- 1873 - Export of Sri Lanka’s first tea consignment of 23 lbs from Loolekandura Estate to London.
- 1883 - The first public Colombo Auction was held at the premises of Somerville & Co.on 30th July, 1883, under the auspices of Ceylon Chamber of Commerce.
- 1925 - Establishment of Tea Research Institute.
- 1976 - Sri Lanka Tea Board was established.
- 1982 - Production and Exports of Green tea commenced.
Tea Types from Sri Lanka

- Ceylon Tea grouped according to their elevations,
  - High Growns ranging from 1200 m upwards. High grown teas from Sri Lanka are reputed for their taste and aroma.
  - Medium Growns covering between 600 m to 1200 m. The medium grown teas provide a thick coloury variety which are popular in Australia, Europe, Japan and North America.
  - Low Growns from sea level up to 600 m. The teas produced in low grown areas are mainly popular in Western Asia, middle-East countries.

<table>
<thead>
<tr>
<th>Elevation</th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>6,104,574</td>
<td>6,449,647</td>
</tr>
<tr>
<td>Medium</td>
<td>3,940,900</td>
<td>3,798,172</td>
</tr>
<tr>
<td>Low</td>
<td>11,775,828</td>
<td>14,077,150</td>
</tr>
<tr>
<td>Total</td>
<td>21,821,302</td>
<td>24,324,969</td>
</tr>
</tbody>
</table>

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Tea Plantation Areas

[Map of Tea Plantation Areas in Sri Lanka]
Tea Production

- Sri Lanka mainly produced orthodox teas. In the orthodox process of production, semi-dried green shoots are ruptured by rolling achieved from a rotary movement. The rolling process ruptures and twists the leaves. When tea leaves are crushed an oxidation process begins, which is followed by firing and commonly known black tea is produced.
- Sri Lanka also produces Black tea by unorthodox method, namely Cut Tear and Curl (C.T.C).
- Green tea, flavored tea and Bio/Herbal tea are also produced in Sri Lanka.

<table>
<thead>
<tr>
<th>Production</th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthodox</td>
<td>20,447,497</td>
<td>22,920,030</td>
</tr>
<tr>
<td>CTC</td>
<td>1,373,805</td>
<td>1,404,939</td>
</tr>
<tr>
<td>Total</td>
<td>26,068,759</td>
<td>24,623,901</td>
</tr>
</tbody>
</table>

Main destinations of Sri Lanka Tea Exports

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity (MKg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>32.8</td>
</tr>
<tr>
<td>UAE</td>
<td>16.7</td>
</tr>
<tr>
<td>Syria</td>
<td>16.2</td>
</tr>
<tr>
<td>Turkey</td>
<td>14.1</td>
</tr>
<tr>
<td>Iran</td>
<td>9.5</td>
</tr>
<tr>
<td>Jordan</td>
<td>8.1</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>5.6</td>
</tr>
<tr>
<td>Iraq</td>
<td>5.5</td>
</tr>
<tr>
<td>Japan</td>
<td>4.9</td>
</tr>
<tr>
<td>Ukrain</td>
<td>4.4</td>
</tr>
</tbody>
</table>
# CEYLON TEA

- **Tea Research Institute of Sri Lanka**
  Thalawakale
  Kandy Regional Center, Passara Regional Center, Galle Regional Center, Deniyaya Regional Center.
  [http://www.tri.ac.lk](http://www.tri.ac.lk)

- **Ministry of Plantations Industries, Sri Lanka**

- **Sri Lanka Tea Board**

## Chemical Composition of Tea

<table>
<thead>
<tr>
<th>Compound</th>
<th>Description</th>
<th>Reaction</th>
<th>Health Effects</th>
<th>Mostly Found Tea Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyphenol</td>
<td>Antioxidant</td>
<td>Taste</td>
<td>Antiviral and antibacterial properties, anti-cholesterolemic</td>
<td>Green</td>
</tr>
<tr>
<td>Vitamins</td>
<td>A (Caroten), B (B1,B2,B6, Niacin &amp; Folic Acid), C (Ascorbic Acid)</td>
<td>Colour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theaflavin, Thearubigen</td>
<td>Antioxidant</td>
<td>Colour &amp; Taste</td>
<td>Have effects against infections, Strengthen human circulatory system capillary walls, Stroke prevention</td>
<td>Black</td>
</tr>
<tr>
<td>Minerals</td>
<td>Zinc, Calcium, Manganese &amp; Potassium</td>
<td>Colour &amp; Taste</td>
<td>boosts our immune systems, helps prevent some cancers and blindness in old age, and fights colds. Zinc also helps maintain our senses of smell, taste, and vision. Mineral that is essential for life because it helps build strong bones, are found in tea. It is important in fighting osteoporosis, high blood pressure, high cholesterol, and arthritis.</td>
<td>Black</td>
</tr>
<tr>
<td>Tea fibre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amino Acids</td>
<td>Taste</td>
<td></td>
<td>Tranquilizing effect on the brain for anti-stress</td>
<td>Black</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td>Taste</td>
<td></td>
<td>Mental clarity &amp; Awakeness</td>
<td>Black</td>
</tr>
<tr>
<td>Lipid</td>
<td></td>
<td></td>
<td>Excessive amounts are harmful.</td>
<td></td>
</tr>
</tbody>
</table>
## Tea and Health

<table>
<thead>
<tr>
<th>Process</th>
<th>Black Tea</th>
<th>Oolong Tea (Between Green &amp; Black Tea)</th>
<th>Green Tea</th>
<th>White Tea</th>
<th>Scented Tea (Green Tea+Flavour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Red/Black</td>
<td>Brown/Red</td>
<td>Green/Yellow</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>Distinct flavour</td>
<td>Long lasting sweet &amp; earthy flavour</td>
<td>Sweet after bitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>Depend on produced locations</td>
<td>Better with age</td>
<td>Better in fresh</td>
<td>Better in fresh</td>
<td>Better in fresh</td>
</tr>
<tr>
<td>Negative factor of Tea - Caffeine</td>
<td>Most</td>
<td>More</td>
<td>Less</td>
<td>Less</td>
<td>Less</td>
</tr>
<tr>
<td>Presence of Antioxidants</td>
<td>More Flavonoids</td>
<td>More Flavonoids</td>
<td>More Polyphenols</td>
<td>More Polyphenols</td>
<td>More Polyphenols</td>
</tr>
</tbody>
</table>

### Tea and Health

- **Black**
  - Reducing the risk of heart diseases
  - Reducing arthritis and rheumatoid arthritis
  - Preventing osteoporosis
  - Relieve fatigue, Awakening thought, Increasing stress-relief,

- **Green**
  - Reducing the risk of stroke, Reducing blood sugar, Reducing harmful effects from cigarettes smoking, Preventing allergy, cold and flu, Aiding in cancer prevention and reducing tumor growth, Providing oral care and natural fluoride - helps prevent cavities and tooth decay

- **Oolong**
  - Reducing the risk of heart diseases,
  - Reducing the risk of stroke,
  - Reducing the risk of blood clot,
  - Reducing bad cholesterol in the blood, Reducing arthritis and rheumatoid arthritis, Preventing osteoporosis, Keeping fluid balance, Relieve fatigue, Supporting liver-protection, Increasing stress-relief, Aiding weight loss - speeds up the metabolism, burning fat and calories

- **Scented (Jasmine)**
  - Reducing high blood pressure, Reducing blood sugar, Reducing harmful effects from cigarettes smoking, Preventing allergy, cold and flu, Keeping fluid balance, Boosting your immune system, Aiding in cancer prevention and reducing tumor growth, Providing oral care and natural fluoride - helps prevent cavities and tooth decay, Supporting liver-protection, Aiding weight loss - speeds up the metabolism, burning fat and calories
Tea and Health

**Antioxidant properties:** Tea contains natural antioxidants. Through the effects of ‘antioxidants’ - chemicals in tea that help protect blood cholesterol (among other blood components) from being oxidised. Oxidation of cholesterol turns it into a form that is strongly associated with increased risk of heart attacks. This antioxidant effect of tea may also be helpful in reducing the risk of some cancers.

**Antiviral and antibacterial properties:** Tea has properties that may inhibit common throat and stomach infections and may even help suppress influenza virus. Its antibacterial properties can also help reduce the effects of diarrhea and food poisoning.

**Healthy gums and teeth:** Tea inhibits tooth decay and plaque as an organic source of fluoride. It may also combat the specific bacterial activity that causes periodontal disease.

**Nervous system protection:** Black tea may stimulate the nervous system in a way that is good for heart health.

**Cholesterol and heart disease:** Green tea has been credited with helping to lower cholesterol and helps lower the risk of heart disease. Black tea has recently been shown to reduce the risk of heart attack by up to 44%.

**Skin Protection:** Green tea appears to protect the skin from sun damage and the consequent signs of aging. Vitamin: Green tea contains vitamin C in amounts comparable to lemon, vitamins K and P (bioflavonoids) comparable to green vegetable and buckwheat rutin respectively and beta-Carotene comparable to spinach and carrots.

**Minerals:** Zinc: Tea is a rich source of zinc, an essential mineral that boosts our immune systems, helps prevent some cancers and blindness in old age, and fights colds. Calcium: Relatively high amounts of calcium, a mineral that is essential for life because it helps build strong bones, are found in tea. It is important in fighting osteoporosis, high blood pressure, high cholesterol, and arthritis.

**Folic acid:** This compound is essential to the metabolic processes of the body. Specifically, it helps prevent some cancers and can help in the treatment of atherosclerosis.

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As Teas are rich of Antioxidants

2 Cups of tea
= 6 Pints of Beers
= 12 Glasses of White Wine
= 1-1/2 Glasses of Red Wine
Disadvantages of Tea-Drinking

- There are research studies showing that tea drinking reduces the absorption of non-heme iron. It is recommended that those people at risk for developing anemia must limit their tea drinking to between meals or one hour after a meal.
- Too much tannic acid will affect the secretion of the gastric juice, irritate the membrane of the stomach and cause indigestion or constipation.
- Strong tea taken just before bedtime will give rise to occasional insomnia.
- Constant drinking of over-strong tea may induce heart and blood-pressure disorders.
- Reduce the milk of a breast-feeding mothers.
- Put a brown color on the teeth.

But it is not difficult to ward off these undesirable effects: just don’t make your tea too strong.

References

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http://www.tri.ac.lk - Tea Research Institute of Sri Lanka
http://www.green-tea-benefit.com/Longjing_green_tea.html - Green Tea Benefits
http://www.pureceylontea.com/relatedsites.htm - Sri Lanka Tea Board
Tea Manufacture

- **Leaf harvest & Transport** - An average plucking standard should have ideally about 75% fine leaf by weight comprising bud and two leaves.

- **Withering** - The first processing step in the factory and is a process in which freshly plucked leaf is conditioned physically, as well as, chemically for subsequent processing stages. During withering harvested tea flush is evenly spread on the withering troughs. During the process hot and cold air is blown through to remove the moisture of fresh leaf to 30-40 percent which is achieved during 16 to 18 hours of period. Breakdown of complex chemical compounds in the cells to simpler compounds known as the Chemical Withering of the leaf is also done at this stage.

- **Rolling** - The withered leaf is charged in the rollers which vary in size. Normally they are 36" and 48" rollers capable of rolling 70 to 120 kg of withered leaf. The pressure is exerted on the leaf in 'open and pressure' sequence. This operation lasts for 45 minutes. During this process tea leaf is twisted as a result of repeated rolling action and simultaneously leaf tissue ruptures thus forcing out the cell-sap which spreads as a thin film on the surface of the leaf. Various enzymes and their substrates come in contact and enzymatic oxidation starts at this stage. The green colour of leaf starts diminishing and brown coppery colour of leaf begins to appear.

- **Orthodox process of manufacture**
  - In the orthodox process of manufacture maceration or disruption of the leaf cells is carried out in a Rolling Table. During rolling juice from the leaf is wrung out and the leaf is also twisted and broken into smaller particles.

- **The CTC Process**
  - The CTC machine achieves the three actions of Crushing, Tearing and Curling in the same machine at one go. Instead of working on large volumes of leaf, the CTC takes a fast, thin, but steady stream of leaf to pave the way to continuous processing in place of the batch mode of orthodox rollers. Leaf appearance, make, grade percentage, fibre content, liquor and infusion depend on the cut obtained in the CTC machine.