**TEA - Camellia sinensis**

Family - Theaceae  
Genus - Camellia  
Species - sinensis

**Related Plants**

- Ornamental Camellias

**Groups of Tea**

- **China type - C. sinensis var. sinensis**  
  - Northern slope of the Himalayan Mts  
  - Elevated altitudes, semi-humid forest  
  - Bush with small erect leaves with many serrations  
  - Flowers are borne singly  
  - Greater tolerance to drought and low temp.  
  - Main tea produced in China and Japan

- **Assam type - C. sinensis var. assamica**  
  - Southern slopes of the Himalayan Mts  
  - Found in humid dense forest  
  - Tree  
  - Leaves are larger with less serrations, less erect, and tend to droop at tips  
  - Leaves lighter green color  
  - Flower in clusters of 2-4

**Origin and Domestication of Tea**

**Tea Domestication**

- China type domesticated in south China  
  - 4000 years ago?  
  - Spread throughout China and Japan  
- Trading with Europe beginning in early 1600s  
  - Earliest maritime explorations by the Portuguese and Dutch  
  - England enters trade with East India Co in mid to late 1600s  
- East India Trade Co monopoly on tea trade ends in 1833
**Tea Domestication**

- Tea growing in India investigated
  - Seed of China type were planted various locations
  - Grew best in Assam, NE India - so developed plantations
  - Tea-like plants grew wild throughout forest in this area - these were the Assam type tea
  - Initial plantings were mixtures of China and Assam tea plants
    - Outcrossing plants
    - Seed propagation
    - Hybrid tea populations were developed

- Assam region initial area of domestication of Assam tea
  - Late 1800s
    - South India
      - Sri Lanka (esp. after rust destroyed the coffee industry)
      - Java and Indonesia
    - 1930s
      - Equatorial highlands of Central and East Africa
- Current Assam tea is a hybrid type derived from the initial mixed plantings in NE India

**Origin and Domestication of Tea**

- China
- Assam
- 1833
- 1930s

**Tea Production**

- Major Producing Regions
  - By weight 50% total production of coffee

- Much of production consumed locally

**Tea Importations**

- Major Importers
  - Much of production consumed locally
The Tea Plant

- Understorey trees
- Adaptation
  - Temperature
    - 18-30°C
    - Leaf growth stops
      - Below 13°C
      - Above 35°C
    - Shoot replacement cycle related to temp.
  - Equatorial region
    - Grown in highlands (1000-3000 m)
    - At low latitude/altitude need shade for best growth (Assam type)
  - Rainfall
  - Soil type

Tea Plant Propagation

- Seed
  - Short period of viability
  - Germinate in sun and plant into pots once begin to emerge
  - 2-3 years before field planting size
  - Traditional approach to propagation
    - Seedlings are not uniform
- Clonally
  - Single node cuttings
  - Ready for field in 1 year
  - Rooted cuttings are uniform

Tea Planting

- Density of planting
  - 10,000 to 15,000/ha
- Use of shade
  - Initially all tea in Assam with shade
  - Now many areas without shade
    - Higher yields without shade
    - Greater response to fertilizer without shade
  - Some exceptions
    - High heat areas (lowlands of north India, Bangladesh)
    - Low input systems in highlands of Kenya
    - Shaded system is equal or better than unshaded

Tea Training and Pruning

- Training
  - Head back to 20 cm at planting
  - Next year to 40 cm
  - Final year at 60 cm to form a level "plucking table"
- Pruning
  - Need to cut back periodically
  - Plucking table will slowly rise
  - Periodically need to rejuvenate
  - Prune below branches
  - Bring in to bear again
**Tea Harvesting**

- Harvest - Most done by hand
  - Tips
    - Bud only gives best product
  - Fine plucking - most common
    - Bud plus 2 leaves
  - Coarse plucking
    - Bud plus 3 leaves
- Important to begin processing quickly

**Types of Tea**

- Green Tea
  - Not “fermented”
  - Only China type tea
  - Mainly China and Japan
- Oolong Tea
  - Semi “fermented”
  - Produced in Taiwan
- Black Tea (highest production)
  - “Fermented”

**Black Tea Processing**

- Wilting
  - Thin layers of leaves in trays
  - Leaves allowed to dry to lose turgidity
  - 16-24 hours
  - 50% weight loss

**Tea Processing**

- Black Tea Processing
  - Withering
    - Thin layers of leaves in trays
    - Leaves allowed to dry to lose turgidity
    - 16-24 hours
    - 50% weight loss
  - Rolling
    - Twists and breaks up leaf
    - Expresses leaf sap
    - Good contact with flavanols and polyphenol oxidase
    - Done 3-5 times
      - 1st roll = dhools, most tender parts of the leaves
      - 2nd and 3rd rolls = mahls and fines
      - Sticks left over = big bulk
    - Need to keep temp between 27 – 32 C
    - Mechanical heat
    - Heat generated by oxidation
**Black Tea Processing**

- **Fermentation = oxidation**
  - Begins with rollers, dhool stages
  - Flavor and aroma develop
  - Leaves turn dark
  - Temporarily colored theaflavins, thearubigins
  - Last of 4–5 hours

- **Drying = stops oxidation**
  - Time of fermentation
  - Subjective
  - Important in quality
  - In at 82–94°C and finish at 55°C
  - Moisture level
    - 5% to 3% moisture

**Green Tea Processing**

- **Prevent “fermentation”**
  - Initial heating to destroy polyphenol oxidase
  - Rolled at 90–100°C for 45–50 min – 50% moisture
  - Rolled without heat for 15 min
  - Dried at 50–60°C (30–40 min) – 30% moisture
  - Rolled on heated pan (80–90°C), 40 min.
  - Dried at 80°C < 6% moisture
  - Sieve to remove stems and debris
  - Final drying

- **Grading and Sorting**
  - Broken Orange Pekoe (high % buds)
  - Broken Pekoe
  - Orange Pekoe (twisted tender stalk)
  - Pekoe - compact and dense
  - Souchoing – compact and dense
  - Broken Orange Pekoe Fanning

**Quality Control**

- **Use same weight of tea per cup**
- Allowed to steep in hot water same time
- Grade indicated by cup placement

- **Quality Control**
  - Judge quality of tea samples
  - Ensure consistent flavor of blends
  - Tea judged better gets higher price
Top Tea Varietals

• Darjeeling
  – First flush, light almondy, flowery scent, puckery mouthfeel
  – Second flush, darker, more body, hints of muscat
• Formosa Oolong
  – Champagne of teas, grown at lower altitudes
  – Aroma of peach blossoms, wisp of smokiness, almost no mouth pucker (astringency)

Top Tea Varietals

• Yunnan
  – Full body, rich, wispy smokiness, hint of pepperiness
• Earl Grey
  – Flavored tea
  – Black tea with bergamot (citrus of Sicilian origin)
• Ceylon
  – Clean, bright flavor

Health Benefits of Tea

• Reduce risk of Coronary Heart Disease
  – Epidemiological studies
  – Lowers blood levels of LDL cholesterol
• Flavonoids are antioxidants
  – 95% polyphenols in tea are flavanoids
  – Higher anti oxidant activity than Vitamin A, C or E
    - but with less bioavailability
  – Combat free radicals >> reduce risk of cancer
• Much of benefits not experimentally confirmed

Any questions on tea?