**Tea seasons in Assam & uniqueness of Assam tea**

Production of tea in Assam is seasonal. The month of February to March ushers in the plucking season and the first flush is produced. It is followed by the second flush in April and May. Tippy Assam tea of the second flush is considered to be the best and has a characteristic flavor and strong liquor which is unparallel to any tea in the world in its liquor. July to September in the time of heavy rains in Assam and the rain flush tea amounting to about 46 per cent of the whole year’s production is produced in this period. Gradually as the climate becomes cooler and drier, the autumnal flush is produced which has unique quality characteristics. With December the dormant period sets in and the growth season of Assam tea comes to an end only to start again in the month of February-March in the next year.

**Bio-chemical characteristics of Assam tea**

### Table Chemical composition of fresh tea shoot

|  |  |  |
| --- | --- | --- |
| Compounds ( %) | Dry weight | Contribution |
| Total Polyphenols | 25 – 30 | Astringency |
| Flavanols |  |  |
| (-) Epigallocatechin gallate | 8 – 12 |  |
| (-) Epicatechin gallate | 3 – 6 |  |
| (-) Epigallo catechin | 3 – 6 |  |
| (-) Epicatechin | 1 – 3 |  |
| (+) Catechin | 1 – 2 |  |
| (+) Gallocatechin | 3 – 4 |  |
| Flavonols and flavonol glycosides | 3 – 4 |  |
| Leuco anthocyanins | 2 – 3 |  |
| Polyphenolic acids and depsides | 3 – 4 |  |
| Caffeine | 3 – 4 | Briskness |
| Theobromine | 0.2 |  |
| Theophylline | 0.5 |  |
| Amino acids | 4 – 5 | Brothyness |
| Organic acids | 0.5 – 0.6 |  |
| Monosaccharides | 4 – 5 |  |
| Polysaccharides | 14 – 22 |  |
| Cellulose and Hemicellulose | 4 – 7 |  |
| Pectins | 5 – 6 |  |
| Lignin | 5 – 6 |  |
| Protein | 14 – 17 |  |
| Lipids | 3 – 5 |  |
| Chlorophylls and other pigments | 0.5 – 0.6 | Colour and Appearance |
| Ash (minerals) | 5 – 6 |  |
| Volatiles | 0.01 – 0.02 | Aroma |

**Table: Average chemical composition of Orthodox and CTC teas made from Assam clones**

|  |  |  |
| --- | --- | --- |
| Composition | Orthodox teas | CTC teas |
| Water soluble solids (%) | 39.52 | 41.12 |
| Theaflavins (%) | 0.59 | 1.30 |
| Thearubigin (%) | 6.5 | 18.00 |
| Total Lipid | 3.11 | 3.68 |
| Carotenoids (µg/g) | 215 | 176 |
| Flavour volatilesd | 18.40 | 8.20 |
| Total fibre (%) | 19.35 | 18.93 |
| Crude fibre (%) | 11.70 | 11.12 |
| Chlorophyll a (mg/g) | 1.38 | 0.48 |
| Chlorophyll b (mg/g) | 0.77 | 0.58 |

**Table: Biochemical compounds responsible for colour**

|  |  |
| --- | --- |
| Compounds | Colour |
| Theaflavins | Yellowish brown |
| Thearubigins | Reddish brown |
| Flavonol glycosides | Light yellow |
| Pheophorbide | Brownish |
| Pheophytin | Blackish |
| Carotene | Yellow |

**Table: Biochemical compounds responsible for taste**

|  |  |
| --- | --- |
| Compounds | Taste |
| Polyphenol | Astringent |
| Amino acids | Brothy |
| Caffeine | Bitter |
| Theaflavins | Astringent |
| Thearubigin | Ashy and slight astringent |

**Table: Biochemical compounds responsible for flavour**

|  |  |
| --- | --- |
| Compounds | Flavour |
| Linalool, Linalool oxide | Sweet |
| Geraniol, Phenylacetaldehyde | Floral |
| Nerolidol, Benzaldehyde, Methyl salicylate, Phenyl ethanol | Fruity |
| Trans-2-Hexenal, n-Hexanal, Cis-3-Hexenol, Grassy, b-Ionone | Fresh flavour |

**Table: Principal components of black tea beverage**

|  |  |
| --- | --- |
| Components | Concentration (g/100g) |
| Catechins | 3 |
| Theaflavins | 3 |
| Thearubigins | 12 |
| Flavanols | 6 |
| Phenolic acids and Depsides | 10 |
| Amino acids | 13 |
| Methylxanthines | 8 |
| Carbohydrates | 10 |
| Protein | 0.8 |
| Mineral matter | 8 |
| Volatiles | 0.05 |

(Components measured in wt % of extract solids)

Caffeine content in black tea is around 3 – 4% of dry weight. It has stimulating property and removes mental fatigue. The contribution of caffeine to the infusion is the briskness and creamy property resulting from the complex formed by caffeine with polyphenols. Briskness is a taste and sensation while creaming is the turbidity that develops from a good cup of tea when cooled.

The free sugars found in tea shoot are glucose, fructose, sucrose, raffinose and stachyose. Maltose in Assam variety is special. Pectic substances contain galactose, arabinose, galacturonic acid, rhamnose and ribose. Free sugars are responsible for the synthesis of catechins in tea shoot, formation of heterocyclic flavour compounds during processing of black tea and contributing towards water-soluble solids in tea liquor. Cellulose, hemi-cellulose, pectins and lignins are responsible for the formation of crude fibre content in black tea.

Aspartic, glutamic, serine, glutamine, tyrosine, valine, phenylalanine, leucine, isoleucine and theanine (5-N-ethylglutamine) were found to be the principal amino acids present in tea leaf. Theanine alone contributed around 60% of total amino acid content. The amino acids play an important role in the development of tea aroma during the processing of black tea.

The neutral, glyco and phospholipid contents and their fatty acid composition varied in Assam, China and Cambod varieties and also during different stages of black tea manufacture. Total lipid contents (%) and total fatty acids (µg/g) varied at different stages i.e. green leaf, withered leaf rolled leaf, fermented leaf and black tea. The major fatty acids available in tea are linolenic, linoleic, oleic and palmitic.

The four major carotenoids, ß-carotene, lutein, violaxanthine and neoxanthine
were found to decrease appreciably during black tea manufacture. The decrease was found to be higher in crushing, tearing and curling method than in the conventional orthodox method of tea manufacture.

Delphenidin and cyanidin were the major anthocyanidins present in tea leaf.

Citric, tartaric, malic, oxalic, fumaric and succinic acids were detected in Assam leaf.

Good quality teas generally have theaflavin (TF) and thearubigin (TR) ratio, greater than or equal to 0.1 and higher TF/TR ratio is considered as better quality. During black tea manufacture, the catechins through enzymic oxidation and condensation produce TF. Some catechin derivatives through enzymic oxidation and condensation get polymerized to TR. Theaflavins are responsible for brightness, briskness and quality of tea, and thearubigins contribute towards body of tea liquor.

Tea tree leaves are often used to produce tea with nutricious and health-giving properties. The quality of tea is primarily determined by three major characteristic constituents: polyphenols (mainly catechins), theanine, and caffeine. A teagenome studyin China has decoded the genetic building blocks of the entire genetic building blocks of tea plant for insights into tea flavour and independent evolution of caffeine biosynthesis and comparative study among 25 *Camellia* species revealed that highe expression levels of most flavonoid and caffeine but not theanine-related genes contribute to the increased production of catechins and caffeine and thus enhance tea-processing suitability and tea quality. Tea flavour is also affected by many other known, eg, terpenoids and unknown secondary metabolic compounds (Xia, *et al,* 2017).

**Quality of Assam tea and Geographical Indication**

Assam tea is unique in its own way due to which Assam orthodox tea is given Geographical Identification in India. Assam orthodox teas are black with golden tips, while Assam CTC teas have a rich dark brown appearance. Assam tea is also known for its unparallel liquoring qualities which are full-bodied, strong but smooth liquor. Assam tea has a depth of flavor and richness of colour that is unmatched anywhere. Assam tea typically generates rich, full- bodied deep amber liquor in the cup with a brisk, strong and malty taste. The distinctive ‘second flush’ Assam teas are most sought after for their rich taste, bright liquors and are considered one of the choicest teas in the world. The thick bright liquoring Assam tea is termed as best ‘cognac’ of teas in the world. Being one of the places of origin of the three kinds of tea under cultivation in the world, the quality characteristics of Assam teas are best pronounced when cultivated and manufactured in its place of origin. Since the beginning of tea drinking in the United Kingdom, Assam has been considered to be the most ideal for the morning tea and famous English Breakfast Tea with eggs, bacon and sausages, Assam tea is the favourite tea of any time to the connoisseurs around the world when its rallying properties are sought.