An Overview On Processing Of Ctc Tea In Nilgiris

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Abstract- *From the colonial period of British, tea has occupied prominent domicile in each and every house of India. In South India, Tamil Nadu, Kerala and Karnataka are the major contributors of tea production. Black Tea processing is typically carried out in two ways, (i) CTC and (ii) orthodox. CTC refers to the Crush, Tear & Curl process where the withered green leaves are passed in-between two rollers rotating in opposite directions. The study wasmade with Tea factories manufacturing CTC tea in Nilgiri District and the results obtained were discussed.*

Keywords- Black Tea, CTC , Manufacturing, Nilgiris

I. INTRODUCTION

Tea (Camellia sinensis) is a most collective non-alcoholic beverage used by voluminous people across the world. Tea belongs to the family Theacea and is a perennial crop. Having the place of origin in China, tea has been cultivated in almost 35 countries all over the world. The major tea growing countries are China, India, Srilanka, Kenya, Indonesia etc,. Introduction of tea for Indian sub continent dates back to 1780s when Colonel Robert Kyd a British Army officer experimented tea in Culcutta. Later on, in 1823, Robert Bruce a scotish gentleman man discovered tea in Brahmaputra valley. Untill 1832 tea was not cultivated in south India when Dr. Christy introduced tea for the first time in Nilgiris. Tea being an High altitude crop grows in Hilly areas where a soil pH of 4.5 to 5.5 with temperature ranges between 16 oC to 30 oC, Relative Humidity 80% and well distributed rainfall of 150 cm/year. Research says that a unit tea contains 27 % to 32 % of plant compound called polyphenols which are abundant in antioxidants. Few other compounds like Theaflavin responsible for Briskness & Brightness and Thearubigin for colour& strength are also hidden in tea. Many varieties of tea are available in the market but the most common are Black tea (Fully Fermented), Oolong tea (Partially Fermented), Green and White tea (Both Unfermented). The area under tea cultivation in India is about 5,67,000 hectares. Out of which the three states TamilNadu, Kerala and Karnataka holds about 1,15,000 hectares for tea cultivation in India. The three states contributes about 215 million kg of tea per annum. Tea industries plays a vital role in enhancing the socio-economic development of south Indian tea growing regions. On an average India produces 1300 million kg of tea per year. Almost 900 million kg is accounted for Internal consumption.

Objective of the study:

1. To study the manufacturing process involved in making CTC Tea.
2. Leaf quality required for making good quality tea.
3. Physical parameters to be maintained for making fine quality tea.

Steps for Manufacturing CTC Black Tea:

The most commonly known tea for all around us is Black Tea. The prominent steps involved for making CTC Black tea are as follows. It includes, withering, Green leaf sifting, Leaf Conditioning, Rolling, Fermentation, Drying, Sorting and Grading, Packing.

Withering:

Withering is the initial step for manufacturing Black tea. It is the process of removing surface moisture from Green tea leaf. It is done by blowing air over the leaf in the withering trough. The air helps in removing heat and surface moisture of Green tea leaf simultaneously. Ideal Hygrometric difference for proper withering is 7 F. During rainy days hot air is suppled for obtaining proper withering.Care to be taken that the dry bulb temperature of air after mixing should not exceed 35°C. In The Nilgiris tea factories trough withering is commonly practiced. The dimensions of the withering trough varies according to the requirement of tea factories. The width of the standard trough is 6′ and its length varies between 60′ and 120′. The optimum load for withering trough is 3 kg per square feet. It is also significant that pressure inside the plenum chamber of withering trough should be constant throughout the length to have uniform air flow rate. To attain perfect withering fresh leaf is to be stored for a period from nine hours to twelve hours that necessitate chemical changes to take place. In Nilgiris, soft wither around 65% to 70 % has been found to be suitable.

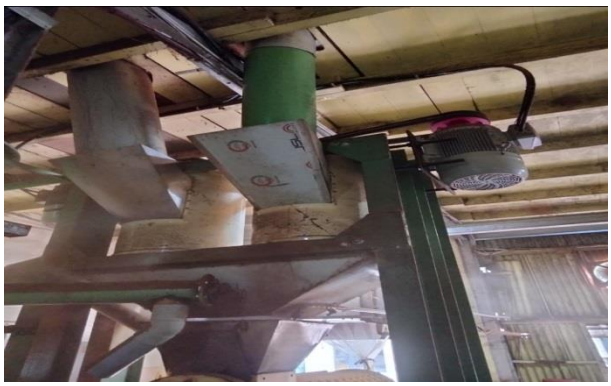
The Coarse percentage in the leaves subjected to study was around 58%. The time utilized for withering was 12 hours. Moisture of around 71% was obtained after withering process.

Green Leaf Sifting:

Sifting is the process of blocking any extraneous matter such as stones, tea branches, sand or metal pieces into factory. Green leaf sifter is a vibrating tray that contains perforated holes or a wire mesh. Strong magnets are provided in the green leaf sifter to eliminate any iron pieces present with the leaf. In case the aforesaid materials bypass the sifter the moving parts of the machinery will be severely damaged the same time. If the leaves were not fed evenly into these machines, the withered leaf could be jammed inside the machinery. Therefore optimum level of feeding should be maintained to use the machine efficiently. Hence, green leaf sifting is prominent prior to processing.

Leaf Conditioning:

Shredder and Rotor vane are the two machines that are used for conditioning the leaf for CTC processing. The output of shredder and Rotorvane are designed suchthat the capacity should match with the CTC as well as Drier. Shredding of withered leaf to a minute size increases the capacity of Rotorvane and enhances mixing of the leaf with Reconditioned tea in the Rotorvane. The cut leaf from the shredder has to be very fine. To confirm this the shredder blades have to be sharpened after completion of day to day production . It is vital that the weight of each blade must be less than one Kg and the blades has to be properly balanced on the knife edge inorder to avoid unnecessary vibrations during operations.



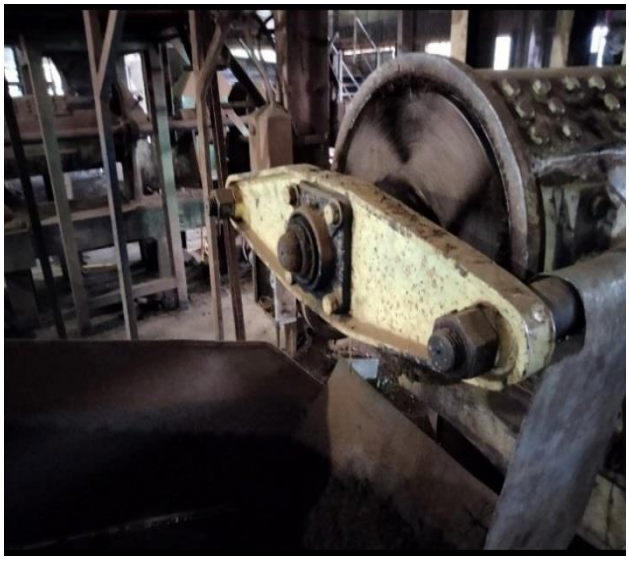
Rotorvane is a preconditioning machine in which cut leaf from shredder is fed. Here the cut leaf and Reconditioned tea are mixed at appropriate ratio. The leaf is processed inside the cylinder in which a rotor with vanes rotates between the resistors that leads the leaf forward to the end plate. The leaf is distorted by passing it inside the cylinder by the revolving cutter. For good results the rotorvane should crush the leaf along with the RC dust at the maximum possible pressure.The temperature should be restricted below 35 ^{0} C. Moisture content has to be 58% to 60%.

The feed rate was controlled as per the specification of the shredder and rotor vane.As the coarse leaf percentage is more, 100% Reconditioned tea was utilized to maintain the density and liquor parameters.Moisture content was maintained around 60%.The temperature measured was 38 ^{0} C.

Rolling

After preconditioning, the macerated leaf along with Reconditioed tea is passed to CTC Machine. The CTC machine comprises of two contra-rotating toothed rollers of equal diameters. The size vary according to the process capacity from, 24″, 30″ and 36″. The two rollers that rotates at different speeds. The speed ratio of slow speed to high speed rollers is 1:10 with speeds between 70:700 rpm and 100:1000 rpm that have good effect. The slow speed rollers have two functions one it acts as a conveyor to transport the leaf and other providing surface for cutting. The mandrel of the rollers is fitted with a number of hollow segments of 2″ width which are fitted side by side. The segments of rollers are made up of SS 304 food grade. These segments are then machined to obtain helical grooves with angular milling cutter. The individual tooth has two longitudinal features one the shoulder and other the back slope. The ratio of the shoulder length to the back slope projection is known as the profile or style ratio which influences quality. In common, shoulder slope ratio of 5:3 will produce a grainy tea with higher dust percentage.The CTC rollers should be machined and sharpened as these are the keys that gives a good finished cut. If the rollersare blunt or damaged quality CTC teas cannot be made. Therefore, sharpening of segments has to be done precisely and as per the schedule. The linear speed difference between the rollers should be checked intermittently to enhance the appearance of made tea and to improve the recovery percentage. To achieve a speed ratio of 1:10, proper matching of equal diameter rollers is essential. In CTC the moisture percentage has to be maintained around 56% to 58%.Tempereture around 35^{0} C to 38 ^{0} C with Relative humidity of 90%.

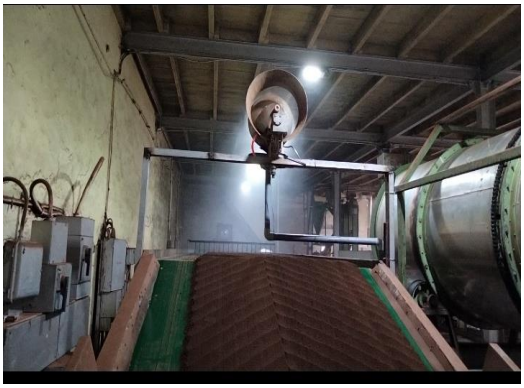
The Feed rate of CTC is fixed by controlling Withered leaf and Reconditioned tea percentage. The temperature measured was 38 ^{0} C. The Relative humidity was maintained above 90%.The moisture content at the outlet of CTC was 58%.



Fermentation :

The output from CTC is fed through a revolving drum called Fermenting Drum that rotates at 1 to 2 rpm for about 60-90 minutes depending upon the environmental condition. The Fermenting drums are fitted out with spiral flights for lifting and sprinkling thedhool to accelerate the forward flow in the drum. Most of the biochemical reactions occurring during fermentation are oxidative in nature.Polyphenols present in tea gets coverted to Theaflavin, Thearubigin and volatile compounds.Theaflavins are responsible for briskness and brightness in tea while thearubigin gives colour and strength.The optimum ratio of Theaflavin and Thearubigin should be 1:10 to 1:12. To attain this, the temperature inside the drum is maintained from 25 ^{0} C to 28 ^{0} C so that the enzyme polyphenol oxidase is very active. Moisture content should be around 55%. The relative humidity should be maintained above 95% to avoid moisture loss. Copious oxygen has to be supplied to enhance fermentation and expel the carbondioxide and heat generated during the process. In drum fermentation, the leaves are constantly rotating and the rotation of the fermentation drum facilitates granulation of the tea particles and increases the bulk density of tea. Rubbing of leaf against each other inside the drum release the juices present in the micro cells of leaf. The briskness of the drum fermented tea is more. Ball breakers are installed at the outlet of drum that ensures minimum ball formation thereby increasing the percentage of dust grades.

During Fermentation the temperature was maintained between from 25^{0} C to 28 ^{0} C. The relative humidity was maintained around 95%. The Theaflavin obtained with 52 % coarse leaf was 0.65 and Thearubigin was 7.5%. 55% Moisture content was maintained for feeding into the drier.

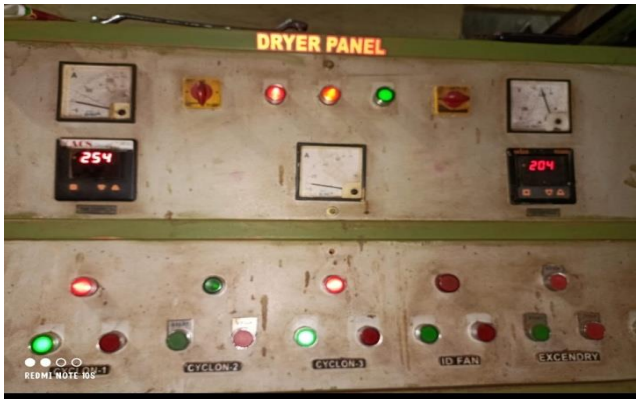


Drying:

Drying is the most expensive process in the manufacture of all kinds of tea. The Objective of drying is to arrest the fermentation process and to reduce the moisture to 2.5 to 3% that helps the tea with good shelf life. The capital investment required for driers is highest among all tea processing machines. For drying tea heat energy is the elementary form which is obtained from Air heater. Drying in tea specifies removal of moisture by evaporation. During the early stages of drying, the tea contains enormous moisture that forms a continuous film of water exists over the entire surface which is referred as exterior/surface moisture. The rate of drying under a given set of air conditions is constant and independent of the moisture content. This period is known as the constant rate of drying.

Commonly used Drier in Nilgiri Tea factories are
Vibro Fluidised Bed Drier:Inlet temperature for Drier should be 120° to 125°C. The exhaust temperature of Drier should from 98°C to 100°C.

The study was conducted with Vibro Fluidised Bed Drier. The inlet temperature was maintained at 125°C (257 °F). The exhaust temperature was maintained at 98°C (208.4 °F) to 100 ^{0} C (212 °F). Firing was carried out at this temperature that resulted in good appearance of Made tea.



Sorting and Grading:

Sorting of Drier Mouth tea has to be done in three stages i) Cleaning of fibre ii) Grading iii) Winnowing. PVC rollers are extensively used to remove the fibres as well as flaky teas from the Drier mouth tea. The principle involved here is that PVC rollers are (static) electrically charged by the contact of a sponge like material known as felt. These electrically charged rollers preferentially attract the fibre and flaky teas whose moisture content is high which are removed from Drier mouth tea.. The cleaning of fibre is considered to be a important process as it enhances the black appearance of tea which is a quality parameter of appearance. Then the tea is passed to sorter. It involves separation of tea into various grades based on different sizes and forms confirming to market requirements. Finally the graded tea is passed to winnower to remove any loose fibre present in that particular grade and send for packing.

Packing

Tea packing is the final step before despatch to the market. Teas are packed in airtight containers, so as to prevent moisture absorption since tea is hygroscopic in nature which directly affects shelf life of tea. Packing chests are usually constructed of plywood, lined with aluminium foil and paper. Corrugated cardboard boxes lined with Aluminum foil and paper sacks lined with plastic are also used. Jute bags lined with Biaxially Oriented Poly Propylene liners are extensively used for the packing of tea in the Industries as the price is low.

Conclusion:

Though the quality of Made tea depends on raw material (Green tea leaf) equally the process involved in making the tea also plays a predominant role. As it is said quality is produced in the teafield and it is only preserved in factory, the preservation requires proper maintenance of critical parameters like Moisture, Temperature, Relative Humidity and Feed rate. Thus, it is concluded that apart from raw material the aforesaid physical parameters ascertain that the quality of tea depends on adopting best process practice in the Factory.

REFERENCES

[1] Ramu.K 2000.Tea Factory manual.Krishi Vigyan Kendra, The United Planters association of south India, Coonoor-643101, Nilgiris
[2] Guidelines on Tea Culture in South indiaJ.B. Hudson, J. Durairaj Muraleedharan.
[3] Hilal, Y and U. Engelhardt.2007 Characterisation of white tea- comparision to green and black tea.Journal of customer protection and Food safety 2:414-421.
[4] John, B.1980. The effect of temperature on enzyme activity during the fermentation phase of black tea manufacture.
[5] Obanda, M., P . O. Owour and R. Mang'oka.2001. Changes in the chemical and sensory quality parameters of the blacktea due to variations of fermentation time and temperature. Food Chemistry 75:395-404
[6] Charturvedula, V. S. P and I. Prakash.2011. The aroma, taste Color and Bioactive constituents of Tea. Journal of Medicinal ,plants Research 5:2110-2124.