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Black tea - Guide to preparation

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for Coffee and Tea (TC 29) and published by the Ethiopian Standards Agency (ESA).

The standard is a reaffirmation for reprint of the Ethiopian Standard ES 651:2001, Black tea - Guide to preparation, with some editorial changes without altering the technical contents in the former text.

Black tea—Guide to preparation

1 Scope

This Ethiopian Standard specifies the guidelines to preparation and most commonly used procedures and technological operations in processing of black tea.

2 Normative references

The following standard contains provisions which through reference in this text, constitutes provisions of this Ethiopian Standard. At the time of publication, the edition indicated was valid. All standard are subject to revision and parties to agreements based on this Ethiopian Standard are encouraged to investigate the possibility of applying the most recent editions of the Ethiopian Standards indicated below. Registers of currently valid standards are maintained in the Ethiopian Standards Agency.

ES ISO 6078, *Black tea – Vocabulary.*

ES ISO 11286, *Tea-Classification of grades by particle size analysis.*

3 Definitions

For the purpose of this standard the following definitions in addition to ES ISO 6078 shall apply.

3.1
plucking
harvesting of suculent young tea shoots from the tea bush for manufacture

3.1.1
fine plucking
plucking shoots of one or two tea leaves and a bud

3.1.2
coarse plucking
plucking shoots of more than three tea leaves and a bud

3.2
catechins
a group of carbon compounds found in tea leaves, responsible for the development of theaflavins and thearubigins through biochemical change during tea fermentation process

3.3
CTC /crush, tear and curl/machine
a type of tea manufacturing machine in which properly withered tea leaf is passed on to serrated cylindrical rollers revolving in different directions and at different speeds to efficiently mince the leaf into fine pieces

3.4
LTP (Laurie tea processor)
a type of tea manufacturing machinery named after its inventor in which the withered tea leaf is chopped into narrow strips

3.5
rolling
the stage of tea manufacture just after withering in which twisting and breaking up of the tea leaf is carried out to allow the juices to mix and fermentation to begin

3.6
rotorvane
a type of tea leaf rolling machine with projecting vanes that propels tea leaves along the enclosing barrel against the resistance of counter vanes projecting from the casing, thus causing cell disruption

3.7
unorthodox manufacture
tea manufacturing method by using CTC, LTP or Rotorvane where the tea leaf is cut into fine pieces ensuring more break up and more mixing of enzymes polyphenols and oxygen whose operation in disrupting tea leaf is more drastic than orthodox manufacture

3.8
hygrometer
an instrument used to measure the humidity of withering tea leaves in troughs.

4 Black tea manufacture

4.1 General

4.1.1 Tea manufacture is based on biochemical process that are of key importance.

4.1.2 The basic principle underlying tea manufacture is the chemical transformation responsible for the formation of properties peculiar to a particular tea type with its particular taste, color, aroma and stimulating properties.

4.1.3 The main task is to maintain and develop those substances present on the original fresh leaves this process involves maintaining of those having a positive effect on tea quality, and entirely destroying those having a negative effect.

4.2 Manufacturing process

Black tea manufacturing process involves plucking green leaf reception, withering, rolling, fermentation, firing, sorting, grading and packaging. Each procedure is briefly described as follows:

4.2.1 Plucking

Plucking is a technological operation used to harvest fresh and suitable bud and leaves from the tip of a tea plant in the process of black tea manufacture.

4.2.1.1 Green tea leaves shall be plucked from the apical portions of a tea plant by traditional hand picking or by using mechanical shears or plucking machines.

4.2.1.2 It shall be noted that the quality of the final made tea depends on the green leaf quality and processing procedures.

4.2.1.3 Good tea cannot be manufactured from poor original leaves, whose quality in turn, depends on many other factors, the most important of these being biological, geographical and agro-technical.

4.2.1.4 Standard of plucking shall be considered as the most important factor in black tea manufacture.

4.2.1.5 Tea pluckers shall pick a bud and two leaves, since it is the best raw material that yields to a quality manufactured tea.

4.2.1.6 Pluckers shall also note that the quality of the tea decreases, as the tea leaves get older

4.2.1.7 The tea leaf shall be properly treated, from the moment it is detached from the tea bush.

4.2.1.8 Particularly bruising of the leaf shall be avoided in any circumstance while it is at the hands of the pluckers or in the containers while transporting the leaf to the factory, because bruised leaf dries out more quickly than unbrvised leaf and when stored or packed in bulk, heats up partly as a result of the exothermic nature of fermentation reaction and partly as a result of continued respiration.

4.2.1.9 Plucked tea leaves shall arrive at a tea factory immediately after they are removed from the tea bush as they are fresh.

4.2.1.10 Plucked tea leaves shall not be allowed to ferment prior to withering.

4.2.1.11 The tea leaf shall be inspected at collection farm sites before it is transported to the factory.

4.3 Reception

4.3.1 Plucked tea leaves shall be inspected upon arrival at the factory to ensure that the plucked tea leaves conform to the required quality i.e. are fresh and have not started to ferment and, that the leaves are not bruised or damaged.

4.3.2 Inspectors shall also ensure that a basket of each plucker contains more than 80 percent of the plucked tea leaves are a bud and two leaves. This can be judged just by physical observation.

4.3.3 The weight of inspected tea leaves shall also be monitored and recorded.

4.4 Withering

Is a technological operation used to remove a large proportion of water from the fresh tea leaves by evaporation.

4.4.1 Withering shall involve extraction of all the surface and varying degrees of moisture from within the leaf by the passage of dry air over freshly plucked tea leaf.

4.4.2 Withering the tea leaves shall be as limp as possible to ensure that the leaves are suitable for rolling and fermentation.

4.4.3 Withering shall create an important and valuable chemical change to take place within the leaves.

4.4.4 Well managed withering shall also facilitate a rapid drying of tea.

4.4.5 Withering shall be done on perforated metal base or wire mesh or any other suitable troughs with varying fresh leaf capacities.

4.4.6 The selection of design of troughs shall be correlated with the economics of space and power (heat source).

4.4.7 Withering troughs shall have a heating system, which allows warm air to be blown into the layer of the tea leaves by reversible ventilators.

4.4.8 This operation shall be monitored by the aid of hygrometer installed in each trough.

4.4.9 It should be noted that the rate of withering depends on the structure of the tea leaves ; the thickness of the leaves in the withering trough, the local climatic condition and the quality of plucking, it is also determined by the method of processing and quality of the withering machinery.

4.4.10 During withering the tea leaves shall be spread out in thin layers about 30 kg of tea leaves in 1 m^2 area of withering trough.

4.4.11 During withering the relative humidity shall be maintained at 60 to 70 percent.

4.4.12 The housing or the shed of the withering troughs shall be well ventilated and shall be capable of protecting the tea leaves from the sun.

4.4.13 The withering process shall be complete within 16 to 24 hours, however satisfactory withering shall be determined by the correct physical state and the smell of the withering tea leaves. Usually properly withered tea leaves release an appley smell and are velvety in texture, the stems do not break when bent and when a handful of leaves is picked up and crushed in the hand. Also the leaves do not show any sign of elasticity when the fingures release their pressure.

4.5 Rolling /Leaf maceration/

Rolling or leaf maceration is a technological operation used to crush, tear and curl. (CTC) properly withered tea leaves causing the release of enzymes which interact to bring about further chemical changes.

4.5.1 Almost all tea produced in Ethiopia is by CTC manufacture.

4.5.2 The rolling operation shall immediately follow the withering process just after the tea leaves are satisfactorily withered.

4.5.3 It shall be noted that the most efficient currently used tea leaf cell rupturing methods are CTC (Crush Tear and curl) machines, and these machines may be used in conjunction with a rotorvane machine which involves one pass through rotorvane for pre-conditioning followed by three pass through a CTC machine for satisfactory cell rupturing and size reduction of the tea particles.

4.5.4 Properly ruptured tea particles shall pass through a sorting operation which after each pass conveys the sorted tea particles to allow fermentation in a separate batch.

4.5.5 The rolling and sorting operations shall form a continuous process.

4.5.6 The physical process of rolling shall result in significant chemical changes of tea leaf constituents.

4.5.7 This process is vital and shall be properly done to the best possible development of the raw tea for the manufactur of high-quality tea.

4.6 Fermentation

A technological operation where properly rolled tea leaves are let to undergo through an essential biochemical change with the help of humidified air and enzyme, so that catching compounds in the leaves are converted to theaflvins (TF) and thearubigins (TR) which contribute to the formation of new taste and aroma characteristics specific to manufactured black tea.

4.6.1 Fermentation shall be performed as an independent technological process in a special room where trolleys or boxes containing rolled leaves are kept at room temperature, relative humidity of 96-98%, and under constant oxygen supply.

4.6.2 During fermentation, rolled tea leaves shall lose their green colour and grassy odour acquiring a coppery red colour and the aroma of fermented tea.

4.6.3 Fermentation process shall also involve an accumulation of coppery red and brown pigments (products of tannin oxidation) which are responsible for the specific colour of the tea infusion, in addition to these, the oxidation process leads to the disappearance of the bitter taste of unoxidized tannin and the development of a pleasant, less astringent taste.

4.6.4 Fermentation process shall be completed in 3-4 hours time, however completion of fermentation shall be judged by the development of a typical aroma.

4.6.5 There are several types of materials used for fermenting tea, such as tiles, cement and aluminium, but the essential point is that they should be easily cleaned.

4.6.6 however properly withered and rolled tea shall be allowed to ferment in a continuous fermenting unit where a layer of fermenting tea leaf is conveyed on a system of moving trolleys or boxes.

4.6.7 Conditioned air shall be introduced in to the fermenting system in order to achieve control over the rate of fermentation.

4.6.8 Therefore since good fermentation condition requires good air circulation without draught, fermenting rooms shall be provided with controlled air conditioning facility in case of fluctuating atmospheric conditions.

4.6.9 It shall be noted that tea-fermentation process both under or over-fermentation are considered as mal-practice in fermentation operations which result in an inferior quality product.

4.6.10 Under fermentation can also be caused by insufficient rolling and cannot be rectified by longer fermentation.

Over – fermented teas lose strength even though they appear to increase in colour.

4.7 Firing /drying/

A technological operation in which properly fermented tea is subjected to lose its moisture until it is 3% by mass by passing the fermented tea through a hot air in a drying machine.

4.7.1 It shall be noted that the main purpose of firing is to suddenly stop fermentation at the very moment when the amount of valuable substances accumulated in the tea leaf is highest, and this process arrest the activity of enzymes and consequently of biochemical process.

4.7.2 During firing the tea leaf shall undergo physical and chemical changes that impart to its specific taste colour and odour.

4.7.3 Firing shall not only arrest the chemical process but shall also produce a stable product of law moisture content (3% by mass) and create suitable condition for handling and transportation activities.

4.7.4 The period of firing of a batch of fermented tea is about 25 minutes. However the system shall have proper control guages.

4.7.5 Firing can be done with the help of either of conventional or modern fluid bed drying machines.

4.7.6 However tea driers shall have systems arranged in such a way that properly fermented tea is exposed to the flow of hot air.

4.7.7 To allow maximum utilization of the hot air the driest tea shall be exposed to the air first and the wettest tea straight from fermentation shall be exposed last. The leaf shall have moisture content in the range of 2.5% to 3% at the point of discharge.

4.7.8 The drying tea shall be discharged from the drier when the moisture content is about 3 percent.

4.7.9 The drying tea shall be properly spread.

4.7.10 The thickness of the spread, speed of trays, and volume of air blown through the drying chamber shall be regulated.

4.7.11 Inlet and outlet temperatures of the drier shall be recorded, in general the inlet temperatures shall be at the range of 82^{o}C to 98^{o}C also outlet temperatures at the range of 50^{o}C to 52^{o}C. However, for fluid bed drier inlet temperature shall be at the range of 120^{0}C to 140^{0}C and the outlet temperatures at the range of 95^{0}C to 105^{0}C.

4.7.12 The firing process shall be as precise as possible because it is detrimental to tea quality, the tea fired at high temperatures is considered to be inferior in pungency, quality and flavour.

4.7.13 Tea is extremely hygroscopic and under no circumstance shall be left exposed since it picks up moisture and easily turn moldy.

4.7.14 After the tea is released from the drier it shall be spread out to cool and then temporarily stored in airtight containers to wait sorting.

Retention of heat in newly fired tea shall be avoided, since it is detrimental to the tea quality.

After firing the tea shall have the typical appearance familiar to all users of the beverage.

4.8 Sorting and grading

4.8.1 Sorting

Sorting is a technological operation used to remove off tea fibers and stalks from properly dried tea leaf manually by winnowing and hand-picking or by sieving or mechanically by using stalk extractors or sorting machine having empty trays with wide range of meshes. The sorting room atmosphere shall be dry and the difference between the wet and dry bulbs of a hygrometre shall be 4^0C.

4.8.1.1 In the tea sorting process very fine particles, dust and fibrous residue tea-fluffs, which are of no commerical value, shall be removed from the dried tea.

4.8.1.2 Pieces of tough stalk shall be removed by hand-picking or by means of a special type of sieve which separates lighter particles leaving the stalk behind.

4.8.1.3 The humidity of sorting rooms shall be controlled at a relative humidity of 60 to 65 percent which is considered to be hygroscopic equilibrium where neither moisture is absorbed nor lost.

4.8.2 Grading

Tea grading is a technological operation used to grade sorted tea according to size and density.

4.8.2.1 Grading shall be done on mechanically oscillating sieves fitted with mesh of appropriate size according to ES ISO 11286.

4.8.2.2 Daily batches of each grade shall be bulked and mixed as high a degree of uniformity as possible before packing.

4.9 Packing and marking

4.9.1 Packing

The tea shall be packed in close, clean and dry containers made of material, which does not affect the tea quality.

Before packing, make sure that the moisture content of the grade does not exceed 5%. If at all the moisture content is above the stated percent the tea shall be put through the drier with an initial temperature of 160^0C for about 10 minutes. Then it should be bulked in the warm atmosphere near the drier to allow it mature and packed later.

Packed tea shall not be stacked on the concrete floor and shall be raised at least 5 cm above the floor.

Packed teas shall be brought to market as quickly as possible.

4.9.2 Marking

The packages of tea shall be marked in accordance with any relevant legal requirement and agreements between the interested parties, and shall bear the Quality Mark upon approval by concerned Authority.

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

International Involvement
ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

<u>More Information</u>?
Contact us at the following address.
The Head Office of ESA is at Addis Ababa.

☎ ***011- 646 06 85, 011- 646 05 65***
🖷 ***011-646 08 80***
✉ ***2310 Addis Ababa, Ethiopia***
E-mail: info@ethiostandards.org,
Website: www.ethiostandards.org

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