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Matcha tea — Definition and characteristics

Thé matcha — Définition et caractéristiques

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Foreword

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This document was prepared by Technical Committee ISO/TC 34 *Food products,* Subcommittee SC 8, *Tea*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Tea is grown and manufactured in numerous countries in the world and is blended and/or consumed in many more. There is some confusion as to the origins, cultivation, appearance and processing for matcha tea and how this can or does differ from green, black, white and other types of tea.

Matcha tea (see Figure A.1) is traditionally prepared with hot water as a beverage in the Japanese tea ceremony called "Chanoyu". Matcha tea is now consumed as a tea beverage prepared with hot water worldwide. In modern usage, matcha tea is also an ingredient in food and beverages.

The desired characteristics of matcha tea and the resulting liquor infusion depend upon a number of factors including the tea plant cultivation and the unique processing method and manufacture using fresh tea leaves.

This document:

— specifies the plant source of matcha tea;

— explains the requirements for cultivation, processing (drying) and grinding;

— identifies the physical and chemical characteristics which, if met, identify that the tea has followed good manufacturing practice.

The cultivation and processing methods are presented as the typical examples which have been developed for the harvest of tencha tea leaves (see Figure A.2) and the production of matcha tea in Japan.

Matcha tea is a specific type of green tea prepared with plant cultivation using shading, leaf steaming and leaf grinding processes. An investigation of the levels of L-theanine, chlorophyll and catechins – including epigallocatechin gallate (EGCG) and epigallocatechin (EGC) – in matcha tea indicates that the levels can vary to those in green and black teas and shows they support the discrimination between matcha, green and black teas. It is possible that the differentiation between matcha, green and black teas needs the use of ratios of the various chemical components, among others.

Matcha tea — Definition and characteristics

1 Scope

This document contains information regarding the tea cultivation, manufacture (including processing and grinding) and sensory analysis of the tea referred to as "matcha tea" in international trade.

It provides an internationally agreed definition of matcha tea based on the plant source, cultivation and production methods used. These are important for the physical, chemical and sensory characteristics of matcha tea.

It does not apply to flavoured matcha tea, blended matcha tea, or decaffeinated or soluble extracts of matcha tea.

NOTE Images of matcha tea and the tencha tea leaf are given in Annex A. Images of the cultivation and processing of the tencha tea leaf are given in Annex B.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
matcha tea
tea derived solely and exclusively from harvested tender leaves, buds and shoots of varieties of the species *Camellia sinensis* (L.) O. Kuntze var. *sinensis* which are grown under shade, known to be suitable for making tea for consumption as a beverage, and produced by acceptable processes notably enzyme inactivation using a steaming process followed by a drying process, without rolling the leaves, and a fine grinding process for the leaf to make tea powder

4 Origins of matcha tea

4.1 Historical origins of matcha tea

Powdered tea was introduced into Japan in the late twelfth century, from its historical roots in China, and is produced using leaves of the *Camellia sinensis* (L.) O. Kuntze.

Tea plants were originally cultivated in open fields. By the sixteenth century, a cultivation method was developed covering the tea bushes with reed mats or rice straw mats which originally prevented the new shoots from having frost damage in late spring. The new shoots of the plants produced under the shade developed a deep green colour with a rich umami taste and unique aromas compared with the shoots produced in open-field environments. This cultivation method using an intensely shaded culture significantly improves the quality of matcha tea. Tea cultivation records show that the use of shading was initiated at the beginning of the sixteenth century in the Uji area of Kyoto. The noble class invited special guests to a tea ceremony called "Chanoyu" where high quality matcha tea was prepared. The

production and consumption of matcha tea has developed along with the culture of the Japanese tea ceremony.

A tea leaf dryer called “tencha-ki” with brick walls is used to dry tea leaves without rolling before being ground (see Figure B.5). Matcha tea is then produced for the tea ceremony by grinding the tencha tea leaves (see Figure A.2) with a tencha (tea) grinder, which is a stone mill specifically designed for matcha grinding (see Figure B.6).

4.2 Descriptive names — Matcha tea and green, black and white teas

Green (see ISO 11287[1]) and black (see ISO 3720[2]) tea are cultivated and processed in different ways and described by the dry tea leaf colour. The colour of the dry leaf is a reflection of the level of aeration (formerly known as fermentation) that the material develops during primary processing. Green teas have minimal to no aeration and black teas have medium to extensive aeration. Green tea has a colour resulting from drying the tea leaf. Black tea has a colour resulting from gently crushing the leaf to mix the contents to allow the oxidation of the polyphenols in the leaf during aeration, which changes the colour of the leaf.

White tea (see ISO/TR 12591[3]) has fine white hairs that cover the surface of the leaf buds and the underside of the leaf surface. This gives an appearance of whiteness to the leaf material. White teas also have minimal to no aeration.

The colour is also observed in the liquor, with green tea producing pale yellow-green to amber colour liquor and black tea producing pale amber to deep brown/black liquor. Skilled tea tasters can differentiate the different qualities of the variety of teas produced.

Matcha tea is finely ground powder of appropriately processed green tea leaf, specifically cultivated under shade to develop deep green shoots and leaves which develop the green colour, umami taste and unique aroma when the leaves are ground. The liquor is prepared by whisking the powder in freshly boiled water and remains in a suspended state without agglomeration or sedimentation.

4.3 Plant source, cultivation and harvest

4.3.1 Cultivation and harvest[4]

The growth of new shoots of the tea plant is suppressed by shading, which increases the leaf area and produces thinner leaves that are deeper green in colour compared with the plants cultivated without shading. Growing the leaves under shade increases the chlorophyll and L-theanine content and lowers the levels of catechins[5].

There are two types of cultivation with shading: a roof shading and a direct shading which cuts sunlight (see Figures B.1 to B.4).

4.3.2 Roof frame shading and harvest

The roof frame shading method comprises covering the tea plants to grow under shade for periods of time (days) without any damage to the new shoots. This results in a higher yield of new shoots when compared with covering the tea plants directly. A ceiling-shelf on the roof frame is constructed over the tea growing area for shading the tea plants.

The two-step shading cultivation is carried out using two different levels of daylight shading for the climate conditions in Japan. The first shading period applies a 70 % to 80 % light shielding, which has a 20 % to 30 % ratio of light transmission during the first flush growing period at the one-leaf stage. After approximately 10 days, shading is increased to a ratio of 95 % to 98 %, which reduces the level of light and new shoots are plucked after 20 to 30 days. The traditional roof shading places reed mats over the top of the roof framework for the first shading period and rice straws are then spread on the top to cover the light gaps and increase the shading (see Figure B.1). The sides of the roof frame are also covered with shading materials to ensure that there is sufficient shading.

The modern method of roof frame shading uses a synthetic fabric screen (black or dark colour) to reduce the level of light. Synthetic fabric screens are used to provide a single screen, which gives a 70 % to 80 % light-shielding ratio. The synthetic fabric screens are placed on the top of a roof frame ceiling-shelf for the first shading period and a second screen is then placed at a lower level to reduce the level of sunlight (see Figure B.2). This two-step shading is applied to produce high quality matcha tea.

A single layer of shading is also practised (see Figure B.3). Rice straws screens are placed over the roof frames above the tea bushes with gaps in between each of them to create a stripe pattern. The gaps between each of the screens allow sunlight to pass through. After approximately 10 days the whole tea garden is covered with the rice straw screens to reduce the sunlight and after 20 days to 30 days the new shoots are plucked.

4.3.3 Direct shading and harvest

The tea bushes can also be directly covered using synthetic fabric shading screens, which cuts 85 % of sunlight during the first flush growing period at the one-leaf stage, (see Figure B.4). After 20 days, the new shoots are plucked. During the second flush season, the new shoots are plucked after 14 days of shading.

4.4 Processing and production stages

4.4.1 Harvesting and processing[6]

After the tea leaves have been plucked, they are processed quickly to ensure that the strong flavour produced by shading cultivation is retained. The tea leaves are steamed within approximately 2 h to 3 h after plucking to inactivate the enzymes in the leaves in the first stage. The leaves are then dried without any rolling process in the second stage. The dried leaves are called “tencha leaves” (see Figure A.2). The stems and veins, which cannot be processed into fine powder, are removed in the finishing process.

The tencha tea leaf processing for high quality matcha tea used in the tea ceremony begins with tea leaves and steam flowing into a rotating drum to steam the leaves for 15 s to 30 s at 100 °C. After steaming, the leaves are blown in the air and rapidly cooled to room temperature by the latent heat of vaporization on the moist leaf surface. The leaves are then dried in the tencha dryer (“tencha-ki”), to maintain the temperature around tea leaves between 150 °C to 220 °C. There are several stages (3 to 5) using perforated belt conveyers flowing between brick walls. Drying proceeds mainly with the radiant heat from the fire furnace, heated brick walls and gas flue (see Figure B.5).

The broad quality range of matcha tea, including high quality, follows a precise leaf-drying process using a classic brick wall tencha leaf dryer. Normal quality grade matcha tea is also produced with some flexibility in processing which can include the use of metal dryers.

4.4.2 Dry leaf grinding

The high quality matcha tea is produced using a tencha (tea) grinder (a special stone mill designed to grind tencha leaves) which is rotated by a specifically developed electric motor (see Figure B.6). The mean particle size of matcha tea powder is in the range 10 µm to 30 µm with a median diameter of less than 20 µm. Quality matcha tea powder does not sediment immediately after whisking with hot water and does not agglomerate. Heat generated by grinding tea leaves produces the unique aroma of matcha tea, but excessive heat results in the deterioration of the colour, aroma and taste. The room temperature when grinding tea leaves is also controlled to approximately 20 °C to 25 °C using air conditioning to prevent the deterioration of the green colour.

Normal grade matcha tea can use some grinding processes other than the stone mill method, which can include a ceramic ball mill or a jet mill.

Matcha tea with its small size powder produces a liquor which is very smooth in the mouth.

4.5 Sensory analysis

The quality assessment by sensory analysis between matcha tea and ordinary powdered green teas is organoleptically evaluated by skilled tea tasters who base their judgements on their significant tasting experience of the sensory characteristics of both tencha tea and matcha tea. The colour, aroma and umami taste of the tencha tea are monitored before grinding. Matcha tea has several organoleptic characteristics which include the appearance of ground tea before the preparation (this includes colour and the fineness of particle size) and the appearance of matcha tea mixed with hot water (this includes foaming and foam colour). The umami taste and aroma characteristics are also monitored.

The sensory characteristics developed during the shading cultivation of tea leaves are a bright green colour, umami taste and a greenish aroma. These are the key characteristics which identify the quality of matcha tea. The smooth texture in the mouth and the aroma developed with fine grinding in the mill are also key discriminatory characteristics for matcha tea.

Sensory evaluation of matcha tea is performed using 2 g of matcha tea, which is weighed on a piece of weighing paper or a tea-tasting tray, and the colour and particle size of the powder is evaluated. The 2 g tea sample is placed in a tea-tasting bowl for matcha tea and 100 ml of boiling water is poured into the bowl. The tea is stirred with a tea whisk and remains in a suspended state without agglomeration or sedimentation. The tea liquor is evaluated for the levels of frothiness, foam colour and taste.

4.6 Shelf life

Tencha tea leaf is packed in closed, clean and dry containers or packaging made using materials (including aluminium foil) which ensure the tea leaf is kept dry to maintain the quality (see ISO 9884-1[7] and ISO 9884-2[8]).

Matcha tea quality deteriorates immediately after grinding the tencha tea leaves which produces the matcha tea powder. Matcha tea deterioration is caused by a combination of exposure to light, storage temperature, ambient moisture and oxygen surrounding the powder. Poor storage conditions also result in the colour of matcha tea powder changing from bright green to olive green due to the degradation of chlorophylls to pheophytins.

Storing matcha tea powder in sealed aluminium foil pouches with minimum air content maintains the tea quality, and this is improved by flushing nitrogen into the pouches before sealing them.

The shelf life of high quality matcha tea can also be extended when stored at 5 °C or below before being prepared for consumption at the tea ceremony.

5 Characteristics

5.1 General characteristics

The tea is clean and free from extraneous matter when inspected visually and the mean particle size is in the range 10 µm to 30 µm with a median diameter of less than 20 µm.

The tea is free from taint, and has the characteristics, appearance, colour and taste produced from tea leaves grown with good shading when assessed by sensory analysis.

The tea is made from pure tea leaves and is free from any additives including colouring agents and flavourings.

Methods of sensory analysis for tea are presented in ISO 1839,[9] ISO 3103,[10] ISO 6078[11] and ISO 18449[12].

The sensory characteristics enabling the evaluation of the correct quality of matcha tea include:

— characteristics resulting from shading including a bright green colour, umami taste, the level of bitterness and the shaded leaf aroma;

— characteristics due to the method of grinding including the roughness.

5.2 Chemical characteristics

An international investigation into the total polyphenols and catechins contents in green, black, white and matcha tea gave only limited analytical information on matcha tea utilizing the agreed ISO methods.

Further work is required on matcha tea to include more samples, additional origins and chemical components including catechins, chlorophyll, free amino acids (including theanine) and caffeine. Inclusion of these additional components and investigation on comparing ratios of the components can prove useful in defining matcha tea based on chemical composition. A limited amount of data of the chemical composition of matcha tea has been published in the scientific literature[5].

Investigating samples which conform to the outlined definition herein, based on cultivation and processing steps with a wide range of origins is taking place.

Annex A
(informative)

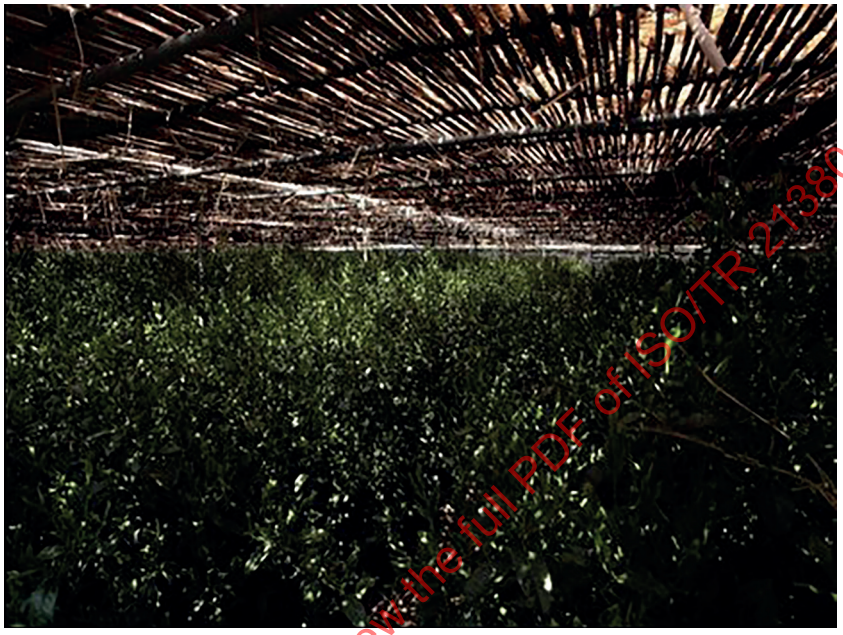
Appearance of sub-types of matcha tea and tencha tea

Figure A.1 — Appearance of matcha tea

Figure A.2 — Appearance of tencha tea

Annex B
(informative)

Cultivation and processing



a)

b)

Figure B.1 — Roof shading covering by reeds and mats and rice straw

Figure B.2 — Roof shading covering by synthetic fabric screens

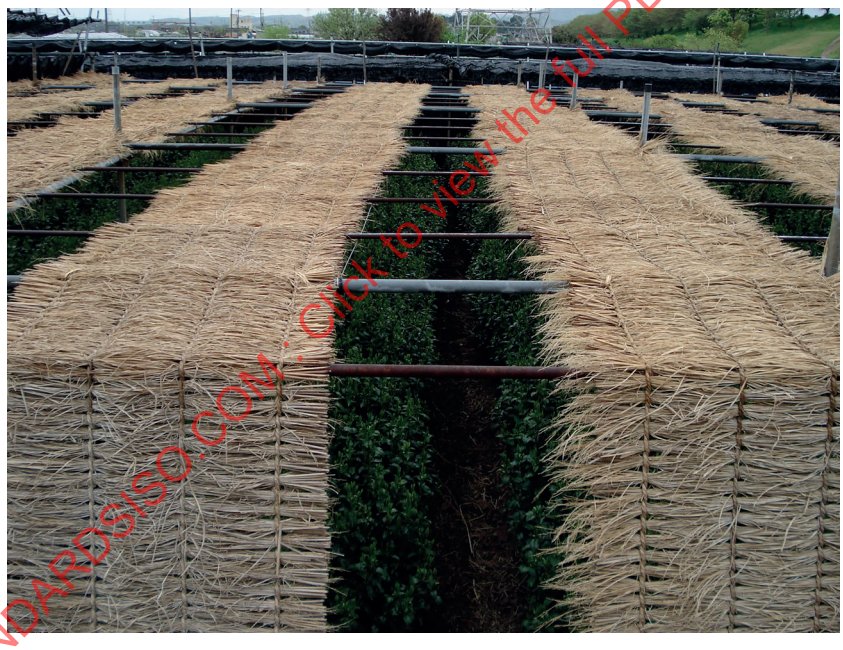


Figure B.3 — Single-layer roof shading covering