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Green coffee — Defect reference chart

Café vert — Table de référence des défauts

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Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Defect reference chart	2
Annex A (informative) Main causes of defects, their effect on roasting/brew flavour, and possibilities of removal	5
Annex B (informative) Application example	9
Annex C (informative) Defects found in green coffee	10
Bibliography	15

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10470 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 15, *Coffee*.

This second edition cancels and replaces the first edition (ISO 10470:1993), which has been technically revised. Compared to the previous edition, the presentation has been simplified.

The photographs in Annex C are reproduced by kind permission of Nestec Ltd. and Illycaffè s.p.a.

This corrected version of ISO 10470:2004 incorporates the following corrections:

- in 4.9, the value for the loss of mass for spongy beans has been changed to 0,5;
- in Annex B, the values for loss of mass for spongy beans have been corrected to 0,5 and 1,5.

Green coffee — Defect reference chart

1 Scope

This International Standard provides a chart which lists the main five different categories of defects which are considered to be potentially present in green coffee as marketed throughout the world, whatever its species, variety, and after-harvest processing (wet or dry).

This chart shows the influence of such defects on the loss of mass and on the sensorial concern by using the coefficients (0), (0,5) and (1). Each defect is given one of these values depending on how seriously it affects the above-mentioned characteristics. Thus, the final assessment can become a useful tool for the trading parties involved, and also gives a good indication to the purchaser of the quality of the green coffee concerned.

The definitions can be used to specify terms of bilateral purchasing contracts or to classify coffee lots for their presentation to green coffee buyers or at a stock exchange.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3509, *Coffee and its products — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3509 and the following apply.

3.1

loss of mass

any loss that can occur in the raw material during the coffee processing, bringing at the end an output loss of a coffee lot

NOTE This International Standard assesses the influence of the defects on the loss of mass, taking into account that possibilities to sort out defects exist and are used everywhere. Later revisions will introduce new elements if appropriate techniques are developed to also remove other defects and if special techniques are made available on a broader basis.

3.2

sensorial concern

influence of a defect on the organoleptic properties of the product cup as well as the visual properties of the coffee presented to the final consumer

3.3

normal coffee

beverage that meets consumers' expectations

NOTE Good trade practice agrees that a sound coffee lot is good commercial quality coffee as generally agreed upon, with the ultimate goal of producing a coffee homogeneously constituted by coffee seeds, excluding the categories of defects defined in 3.5.

**3.4
defect**

anything diverging from the regular, naked sound green coffee beans expected in a coffee lot

NOTE They may be measured as a mass fraction in percent of defective items in the lot.

3.5 Categories of green coffee defects

**3.5.1
non-coffee defect**

foreign matter not originating from the coffee fruit

NOTE It should be removed at an appropriate stage (e.g. during green coffee cleaning) by sieving, classifying or by metal removal. The correct removal of these defects leads to a physical loss. Their accidental or fraudulent (presence) remaining up to the final production of roast and ground or soluble coffee may result in damage to the grinder or even fraud against the consumer.

**3.5.2
defect of non-bean origin**

coffee matter not originating from the bean

NOTE Defects of this type (e.g. skins/husks/hulls or dried unpulped cherries) are in general removed by air classifying, leading to a physical loss. Their accidental or fraudulent remaining presence may result in product contamination, consumer deception, and trade distortion.

**3.5.3
irregularly formed bean**

bean divergent in form, shape and integrity

NOTE This may become a defect for those who sell roast coffee as whole beans. Although there might be a loss when removed and sensorial concern after inappropriate roasting, the overall relevance is small.

**3.5.4
bean of irregular visual appearance**

bean divergent in colour and surface appearance, and which risks influencing the cup taste

NOTE Whereas the application of general manufacturing practices can often eliminate non-coffee and non-bean defects, the visually identifiable defects of class 3.5.4 should be removed from the lot by special manufacturing practices, such as optical sorting techniques. Depending on the defects, sorting techniques can be sophisticated and expensive, or do not exist.

**3.5.5
off-taste coffee**

defect of sensory concern, identified after sample roasting and cup testing, with a possible further risk of other contamination

NOTE Purely organoleptic off-tastes are easily sorted out. They can be identified after cupping a roast and ground coffee sample, following proper roasting and brewing.

4 Defect reference chart

The following coefficients for sensorial concern are used in the chart:

- 0 = no influence
- 0,5 = medium influence
- 1,0 = serious influence

Name of defect	Definition or characteristics of defect	Loss of mass	Sensorial concern
1 Defects associated with foreign matter			
1.1 Stones	Stone of any size found in a green coffee lot	1	0
1.2 Sticks	Twig of any size found in a green coffee lot	1	0
1.3 Soil agglomerate	Granulated lump of soil particles	1	0
1.4 Metallic matter	Metallic particles such as those found on the drying area after drying the coffee and/or after degradation of the industrial equipment	1	0
1.5 Foreign matter other than described	Foreign matter such as cigarette stubs, plastic particles, bag particles, strings	1	0
2 Defects associated with non-bean matter coming from the coffee fruit			
2.1 Bean in parchment (pergamino)	Coffee bean entirely or partially enclosed in its parchment (endocarp)	0,5	0
2.2 Piece of parchment (pergamino)	Fragment of dried endocarp (parchment)	0,5	0
2.3 Dried cherry (pod)	Dried fruit of the coffee tree, comprising its external envelopes and one or more beans	0,5	0
2.4 Husk fragment	Fragment of the dried external envelope (pericarp) NOTE These are divisible into small, medium or large fragments.	0,5	0
3 Defects associated with irregular beans			
3.1 Malformed bean; shell and ear	Coffee bean whose abnormal shape makes it clearly distinguishable NOTE This category includes: — shell: malformed bean presenting a cavity; — ear: malformed bean with ear shape. Both originate from the elephant bean.	0 ^a	0,5 ^a
3.2 Bean fragment	Fragment of a coffee bean of volume less than half a bean	0,5	0,5
3.3 Broken bean	Fragment of a coffee bean of volume equal to or larger than half a bean	0,5	0,5
3.4 Insect-damaged bean	Coffee bean damaged internally or externally by insect attack	0	0,5
3.5 Insect-Infested bean	Coffee bean harbouring one or more dead or alive insects at any stage of development	0 ^a	0,5 ^a
3.6 Pulper-nipped bean; pulper-cut bean	Wet-processed coffee bean, cut or bruised during pulping, often with brown or blackish marks	0 ^a	0,5 NOTE Sometimes a fermented flavour may appear.

Name of defect	Definition or characteristics of defect	Loss of mass	Sensorial concern
4 Defects associated with visual appearance			
4.1 Black bean and partly black bean	Coffee bean whose interior is partly or totally black (endosperm)	0	1
4.2 Black-green bean	Unripe coffee bean, often with a wrinkled surface, with dark green almost black colour and a glossy silverskin	0	1
4.3 Brown bean ("ardido")	Coffee bean with a range of colours: very light brown-reddish, brown-black, yellowish green to dark reddish brown, and dark-brown internally (endosperm) NOTE 1 When roasted and infused, it produces an unpleasant sour taste (stinker). NOTE 2 This is not to be confused with the foxy silverskin bean ("melado"), which is internally a normal green colour revealed by gentle scratching of the surface, and produces no off-flavour in the cup.	0	1
4.4 Amber bean	Coffee bean with yellow colour, usually semi-transparent	0	0,5
4.5 Immature bean; "quaker" bean	Unripe coffee bean, often with a wrinkled surface, having a greenish or metallic silverskin; cell walls and internal structure are not fully developed	0	0,5 NOTE Sometimes a fermented flavour may appear.
4.6 Waxy bean	Coffee bean with translucent waxy appearance and a range of colours from yellowish green to dark reddish brown, the latter being the most typical; the cell and surface have a decayed fibrous appearance	0	0,5 NOTE Sometimes a fermented flavour may appear.
4.7 Blotchy bean; spotted bean	Coffee bean showing irregular greenish, whitish or sometimes yellow patches	0	0,5
4.8 Withered bean	Coffee bean which is wrinkled and light in mass	0	0,5
4.9 Spongy bean	Coffee bean of consistency analogous to that of cork (i.e. whose tissue can be indented by pressure of fingernail); it is generally whitish in colour	0,5	0,5
4.10 White bean	Coffee bean with a whitish surface	0	0,5
5 Defects mostly evident in cupping			
5.1 Bean producing stinker or fermented flavours	Bean with a normal appearance but a very unpleasant flavour is detected in the cup (like fermented, sour, stinker or rotten fish) NOTE On being freshly cut or scratched, the bean presents a very unpleasant odour.	0	1
5.2 Bean producing other current off-flavours	Bean has a normal appearance but in the cup unpleasant musty, foul, dirty, earthy, woody, Rio, phenolic or jute-bag-like flavours can be detected	0	1
^a Defects mostly affecting roasted whole bean quality.			

Annex A (informative)

Main causes of defects, their effect on roasting/brew flavour, and possibilities of removal

Causes	Effects on roasting/ brew flavour	Removal ^a
A.1 Defects associated with foreign matter		
A.1.1 Stones		
Inadequate separation/cleaning	Effect mainly economic	B
A.1.2 Sticks		
Inadequate separation/cleaning	Non-specific downgrading of flavour	B
A.1.3 Soil agglomerates		
Inadequate separation/cleaning	Effect mainly economic	B
A.1.4 Metallic matter		
Inadequate separation/cleaning	Effect mainly economic	B
A.1.5 Foreign matter other than described		
Inadequate separation/cleaning	Effect mainly economic	B
A.1.6 Insect-infested bean		
Attack on cherries by <i>Hypothenemus hampei</i> (coffee berry borer), by <i>Araecerus</i> insects, during storage due to inadequate storage controls, or by any other kind of pest		A
A.2 Defects associated with non-bean matter coming from the coffee fruit		
A.2.1 Bean in parchment (pergamino)		
Faulty hulling and separation of the dry parchment	Non-specific downgrading of flavour	B
A.2.2 Piece of parchment (pergamino)		
Inadequate separation after hulling the parchment	Non-specific downgrading of flavour	B
A.2.3 Dried cherry (pod)		
Incorrect dehusking, allowing whole dried cherries to remain in the coffee	Non-specific downgrading of flavour Foul odour and flavour	B
Inadequate separation after hulling the parchment	Non-specific downgrading of flavour	
A.2.4 Husk fragment		
Poor separation after dehusking	Non-specific downgrading of flavour Foul flavour	B

Causes	Effects on roasting/ brew flavour	Removal ^a
A.3 Defects associated with irregular beans		
A.3.1 Malformed bean		
General handling producing the separation of the inner and outer parts of an elephant bean (shell and ear)	Uneven roast with respect to normal beans; less acidity May split on roasting and char at edges	B
A.3.2 Bean fragment		
General handling; formed mainly during dehulling operations and/or dehusking	Difficulties occur in roasting May affect flavour	B
A.3.3 Broken bean		
General handling; formed mainly during dehulling operations and/or dehusking	Uneven roast; less acidity May affect flavour slightly	B
A.3.4 Insect-damaged bean		
Attack on cherries/seeds by <i>Hypothenemus hampei</i> (coffee berry borer) or by <i>Araecerus fasciculatus</i> insect during storage, due to inadequate storage controls	When caused by <i>Hypothenemus hampei</i> (coffee berry borer) the beans have a slightly darker colour than normal beans on roasting Slightly bitter flavour or tarry, bitter flavour	A
A.3.5 Pulper-nipped bean; pulper-cut bean		
Faulty adjustment of pulping machine or feeding with under-ripe cherries or malformed beans	Will affect the flavour according to degree of damage	B
A.4 Defects associated to visual appearance		
A.4.1 Black bean and partly black bean		
Effect on cherries/beans whilst on trees and on the ground caused by coffee cherry with disease (anthracnosis) due to attack by <i>Colletotrichum coffeanum</i> or other species of fungi Other possible causes are — carbohydrate deficiency in the beans due to poor cultural practices, — mature beans/cherries subjected to over-fermentation by moulds/yeasts, and subsequent drying	Slow to roast; roasted black beans tend to be yellowish Flavour differences from different causes; generally harsh flavour	C

Causes	Effects on roasting/ brew flavour	Removal ^a
A.4.2 Black-green bean		
Immature beans, affected by high temperatures Immature beans, affected by faulty drying in parchment, and in cherry (either patio or mechanical), e.g. high temperatures (without microbiological development)	Rotten fish flavour	C
A.4.3 Brown bean ("ardido")		
Brown beans can be produced by an excess treatment in the fermentation step; the cause of a sour bean is not certain With "ardido" beans, it is believed to be due to mature beans being killed in drying cherries, and subsequently infected by xerophilic moulds Also over-ripe cherries may become fermented during a slow drying process of thick layers, resulting in excess internal heat development with embryo destruction It can be caused by accidental fermentation by moulds on either mature or immature beans before drying It can also be caused by attack by <i>Antestia</i> bugs or blight on the immature cherry, or by over-ripe cherries and faulty pulping, or by prolonged slow drying of over-ripe cherries	Sour flavour Other defects may occur (e.g. onion, potato-like, wine-like, acetic flavour) Slightly fruity/cherry taste; sometimes harsh/commonish	C
A.4.4 Amber bean		
Iron deficiency in the soil	Lack of acidity (i.e. commonish flavour)	C
A.4.5 Immature bean; light green bean		
Caused by cherries being picked before ripe (i.e. green, yellow skins); the silver skin is metallic green in colour	Slow and irregular roast More bitterness; lack of acidity; commonish flavour Sometimes has a fermented taste	C
A.4.6 Waxy bean		
Bean from cherries picked when over-ripe (brown skins); fermentative effect of bacteria on surface and interior	Gives various flavour effects from fruity to sulfurous	C
A.4.7 Blotchy bean; spotted bean		
Faulty drying of the parchment (e.g. broken parchment)	Non-specific downgrading of flavour	C
A.4.8 Withered bean		
Not clearly identified or distinguished, and cause not established	Non-specific downgrading of flavour	C

Causes	Effects on roasting/ brew flavour	Removal ^a
A.4.9 Spongy bean		
Moisture absorption during storage/transportation leading to enzyme activation	Roasts rapidly, tending to carbonize Lack of acidity (commonish flavour); woody flavour with poor aroma	C
A.4.10 White bean		
Discoloration of surface due to bacteria of the genus <i>Coccus</i> during storage/transportation; associated with old crop coffee	Non-specific downgrading of flavour Stale taste for every kind of coffee	C
A.5 Defects mostly evident in cupping		
A.5.1 Stinker bean		
Cause not certain, but associated with fermentation and washing stages where some beans have been retained over-long or exposed to polluted water Also delay in pulping can cause stinker beans	Foul odour, rotten fish flavour, fermented flavour	A
A.5.2 Beans producing other current off-flavours		
Different causes	Musty, foul, dirty, earthy, woody, Rioy, phenolic or jute bag like flavours	A
^a A = No direct removal B = Usual techniques like sieving C = Special techniques.		

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Annex B (informative)

Application example

Obtain a representative sample of 300 g after having performed adequate sampling following a procedure such as given in ISO 4072.

Spread the test portion over a plain orange or black surface and examine it under diffuse daylight (not direct sunlight), or artificial light reproducing daylight as closely as possible. For a better identification, refer to Annex C of ISO 10470:2004, *Green coffee — Defect reference chart*, which shows colour photographs of the defects.

Pick out all foreign matter and defective beans and group them by categories as defined in ISO 10470. Put them in separated piles or different containers. Weigh, to the nearest 0,1 g, each category of foreign matter and defects and calculate their mass fraction as a percentage.

The impact of foreign matter and defects on the quality is calculated for both loss of mass and sensorial concern by multiplying each percentage by the coefficient found in the Defect reference chart of ISO 10470. At the end, the final values obtained are equivalent to "Quality Impact Units".

Hypothetical example

Defect	Mass		Loss of mass		Sensorial concern	
	g	%	Coefficient	Actual	Coefficient	Actual
Stones	1,2	0,4	1,0	0,4	0	0
Beans in parchment	3,0	1,0	0,5	0,5	0	0
Black beans	3,0	1,0	0	0	1,0	1,0
Immature beans	10,5	3,5	0	0	0,5	1,75
Spongy beans	9,0	3,0	0,5	1,5	0,5	1,50
Brown beans	7,5	2,5	0	0	1,0	2,50
Sound beans	265,8	88,6				
TOTAL	300,0	100,0		2,4		8,75

This procedure can be applied to any contract of purchase of green coffee that may be negotiated between provider and client. For (a) certain defect(s), the contract may impose either a maximum mass fraction in percent or a maximum value of "Quality Impact Units". Such limits may be defined in advance between the two parties.

Annex C (informative)

Defects found in green coffee

Beans in parchment (2.1)



Pieces of parchment (2.2)



Dried cherries (2.3)



Husk fragments (2.4)



Malformed beans (ear) (3.1)



Malformed beans (shell) (3.1)



Bean fragments (3.2)



Broken beans (3.3)

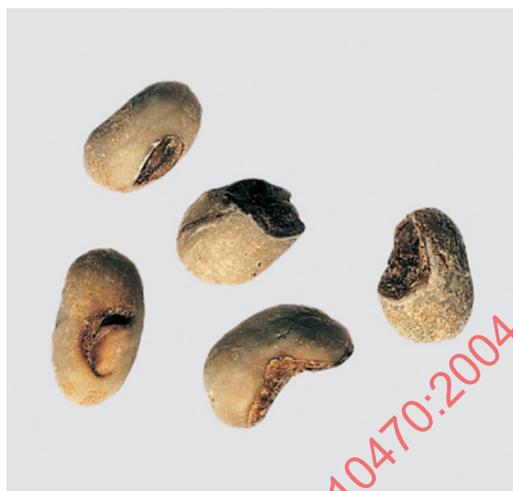


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Insect-damaged beans (3.4)



Pulper-nipped or pulper-cut beans (3.6)



Black and partly black beans (4.1)



Black-green beans (4.2)



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