



DRAFT EAST AFRICAN STANDARD

Barley for brewing — Specification

Draft for Public Review Dec to Feb, 23

EAST AFRICAN COMMUNITY

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Partner States in the Community through their National Bureau of Standards, have established an East African Standards Committee.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Introduction

Barley is an important crop in East Africa associated with production of beer. Acceptability of this product is determined by its overall malting performance, brewing performance and the beer quality. This standard has been prepared to provide guidance in evaluating good quality barley for brewing.

In preparation of this standard considerable assistance was obtained from Indian Standard IS 6394:1993 - *Malting Barley Specification (First Revision)* published by the Indian Standard Institution and ISO/DIS 10520.2 - Native Starches — *Determination of starch content - Ewers polarimetric method* - published by International Organization of Standards.

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Barley for brewing — Specification

1.0 Scope

This draft East African Standard specifies the requirements sampling and test methods for barley of the varieties grown from (*Hordeum vulgare L.*) intended for brewing.

2.0 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.

CODEX STAN 193, General standard for contaminants and toxins in food and feed

EAS 38, Labelling of pre-packaged foods — Requirements

EAS 39, Hygiene in the food and drink manufacturing industry — Code of practice

EAS 900, Cereals and pulses — Sampling

EAS 901, Cereals and pulses — Test methods

ISO 10520, Native starch — Determination of starch content — Ewers polarimetric method

ISO 520, Cereals and pulses — Determination of the mass of 1 000 grains

3.0 Terms and definitions

For the purpose of this standard, the following terms and definitions shall apply.

3.1 sound barley

kernel of barley remaining after removal of foreign matter (see 3.2) and damaged kernel (see 3.4).

3.2 foreign matter

all organic and inorganic material

inorganic matter: include stones, glass, pieces of soil and other mineral matter

organic matter: any animal or plant matter (seed coats, straws, weeds) other than rice, damaged rice, other kernels, inorganic extraneous matter and harmful/toxic seeds”

3.3 foreign kernels

Food kernels other than the kernel under consideration.

3.4 damaged kernels

kernels or pieces of kernels that are sprouted or internally damaged as a result of heat moisture, weather or microbes.

3.5 broken kernels

pieces of barley that are less than three-quarters of a whole kernel and with the germ end broken off

3.7 mealy barley

kernels which when cut transversely show a white endosperm having an opaque and mealy appearance.

3.8 fine appearance

characteristic appearance of kernel not stained and withered.

3.9 steely barley

kernels which when cut transversely show a vitreous endosperm.

3.10 shrivelled kernel kernel

kernel which is poorly filled, light and thin whose build- up of reserves has been halted due to physiological or pathological factors

3.11 immature kernel

kernel which is unripe and/or badly developed and is distinctly green in colour

4 Requirements**4.1 General Requirements**

Barley for brewing purposes shall be;

- a) free from live pests
- b) free from moulds and
- c) free from rodent contamination
- d) when cut transversely, the kernels shall be mealy and not steely
- e) barley shall be free from foreign smells such as garlicy.
- f) it shall not be ergoty, smutty, or bleached.
- g) clean, sound, fine appearance, uniform in size, colour and shape of characteristic variety of barley
- h) practically free from germinated/sprouted kernels

4.2 Specific Requirement

Barley kernel shall comply with the limits given in Table 1 when tested in accordance with the test methods specified therein.

Table 1- Specific requirements for barley kernel for brewing

S/N	Characteristics	Requirements			Test method (EAS901)
		Grade 1	Grade 2	Grade 3	
i.	Moisture, % m/m max	13.5			Clause 5
ii.	Size, %, min, below 2.8 mm sieve	[70] 80	65	60	Clause 4
	Size, %, max, less 2.2 mm sieve	2 [-]	3	5	
iii.	Foreign matter, % m/m max	1	2	3	
iv.	foreign kernel, % m/m max	0.5	1	1.5	
v.	Broken kernels % m/m max	4			
vi.	Damaged kernels, % m/m max	1	2.5	4	
vii.	Immature and shrivelled kernels, % m/m max	1	1.5	2	

viii.	1000 kernel mass, in g min	65			ISO 520
ix.	Specific gravity % m/m max	1.3			Annex A
x.	Protein on dry basis % m/m max,	9	11	12.5	EAS901
xi.	Extract yield on dry basis, % m/m min.	70	67.5	65	Annex C
xii.	Starch content, % m/m min.	50			ISO 10520
xiii.	Germination capacity, % by number min.	95	90	-	Annex B
xiv.	Germination energy, % by number min	94	89		Annex B

5.0 Contaminants

5.1 Pesticide Residues

Barley kernel shall comply with pesticide residue limits established by the Codex Alimentarius Commission for this commodity

5.2 Heavy metal

Barley kernel shall comply with those limits for heavy metals contaminants specified in CODEX STAN 193 established by the Codex Alimentarius Commission.

5.3 Mycotoxins

Barley kernel shall comply with maximum limits for mycotoxins specified in Table 2 when tested in accordance with the test methods specified therein.

Table 2 — Mycotoxin limits for barley kernel for brewing

S/N	Mycotoxin	Maximum limit	Test method EAS 901
i.	Total aflatoxins (AFB1+AFB2+AFG1 +AFG2)), µg/kg	10	Clause 9 or 10
ii.	Aflatoxin B1, µg/kg	5	

6.0 Hygiene

Barley kernel shall be produced, prepared and handled in accordance with EAS 39

7.0 Weights and measures

Barley kernel shall be package in accordance with the weights and measures regulations of the destination country.

8 Packaging

8.1

Barley kernel shall be packed in food grade packaging materials which will safeguard the hygienic, nutritional, and organoleptic qualities of the products.

8.2

Each package shall be securely closed and sealed.

9.0 Labelling of retail containers

In addition to the requirements in EAS 38, each package shall be legibly and indelibly labelled with the following:

- a) product name as “Barley kernel”;
- b) grade;
- c) name, address and physical location of the producer/ packer/importer;
- d) batch number;
- f) net weight, in metric units;
- h) storage instruction as “Store in a cool dry place away from any contaminants”;
- i) crop year;
- j) packing date;
- k) Instructions on disposal of used package;
- l) country of origin; and
- m) declaration on whether the barley kernel was genetically modified or not

9.1 Labelling of non-retail containers

Information in 9.1 shall be given either on the container or in accompanying documents, except that the name of the product, lot identification, and the name and address of the processor or packer as well as storage instructions, shall appear on the container.

However, lot identification, and the name and address of the processor or packer may be replaced by an identification mark provided that such a mark is clearly identifiable with the accompanying documents.

10.0 Sampling

Sampling shall be done in accordance with EAS 900

ANNEX A

DETERMINATION OF SPECIFIC GRAVITY

A-1 APPARATUS

50 ml measuring cylinder with ground stopper

A.2 REAGENT

Toluene

A.3 PROCEDURE

Fill the cylinder with toluene at about 20°C and weigh. Then empty the cylinder. Add about 20g of kernel and toluene up to three quarters level. Close the cylinder with the stopper and slowly turn to and from. Fill the cylinder completely with toluene and put the stopper in such a way that no air bubble remains; wipe the cylinder dry and weigh. Finally pour the contents of the cylinder into a large fluted filter preferably of Kiesel guhr containing paper. The filtered toluene can be re-used several times.

A-4 CALCULATION

Specific gravity = $M_2 (0.8825 - 0.009 t) (M_1 + M_2) + M_3$

where M_2 = mass in g of cylinder with stopper and toluene. M_1 = mass in g of barley introduced

M_3 = mass in g of cylinder containing barley and toluene and t = temperature of toluene in °C.

When the toluene stock is kept as close as possible to 20°C and a quantity of 20g is weighed too, use the following formula

Specific gravity = 17.4

$(m_1 + M_2) - M_3$

where M_1 = mass in g of barley introduced

M_2 = mass in g of cylinder with stopper and toluene; and M_3 = mass in g of cylinder containing barley and toluene.

ANNEX B
DETERMINATION OF GERMINATION CAPACITY AND GERMINATION ENERGY

B1 - APPARATUS

B1.1 Soil and Sand Boxes - Paraffined cardboard boxes of suitable sizes (preferably 115x115x40mm or 215x215x45mm)

B1.2 - Sprinkling Devices - A suitable sprinkling device for moistening the substrata.

B1.3 Thermometers

B1.4 terminator - Any kind of germinator in which it is possible to maintain the necessary conditions of temperature and moisture.

B.2 GERMINATION SUBSTRATA

B.2.1 Sand

B.2.2 Germination paper

B.3 PROCEDURE

B.3.1 Take 100 kernels of malting barley and place them in moistened germination paper or sand and keep in the germinator maintained at temperature between 15 to 20°C. The first count of germinating shall be made after 3 days and final count after 6 days. Note the percent kernels germinated at the time of each count.

B.3.1.1 Carry out the tests in either duplicate or triplicate.

B.3.2 The percentage of barley kernels germinating on first count represent the germinative energy.

B.3.3 The percentage of barley kernels germinating at the final count represents the germination capacity of the sample under test.

ANNEX C DETERMINATION OF YIELD OF EXTRACT.

C.1 APPARATUS

C.1.1 Grinding mills - Miag - Seck type. For fine grinding use cone type, 300 rev/mn and for coarse grinding roll type 150 rev/mn

C.1.2 Mash Beakers and counter weights. - Made of either pure nickel Stainless Steel or brass and of such dimensions as to assure tight connection between beakers and grinding mill. If counter weights are used for mash beakers, their tare should be checked frequently.

C.1.3 Mashing apparatus - The beakers, stirrers and solders used should be of the same metal. Each stirrer should be provided with a blade which during operation has clearance of about 2 mm from bottom and 5 mm from wall of the mash beaker. The blade is approximately 8 mm wide and each side has 45 pitch, arranged as in a propeller, to force mash upward. Speed of the mash stirrer shall be so to 100 rev/min, each stirrer of each beaker shall have the same speed. Stir water in the bath thoroughly by mechanical means to assure uniformity of temperature and have level of water above maximum mash level.

C.1.4 Filter Paper - Whatman No.1 or equivalent.

C.1.5 Funnels - Short-stem glass funnels having approximately a diameter of 20 cm. The stem shall extend 3 to 5 cm into the receiving flask.

C.1.6 Flasks - Erlenmeyers of 500 ml capacity

C.1.7 Pyknometers

C.1.8 Water Bath - automatically controlled

C-2 DETERMINATION

C-2.1 Grinding - Weigh approximately 55g of sample at room temperature into a Cared mash beaker and grind through mill set for standardized fineness of grind. Collect finely ground barley in same mash beaker. Mix and without delay place mash beaker with contents on balance and adjust mass of the barley to $50.00 \pm 0.05\text{g}$ by removing excess.

C-2.2 Mashing Procedure,

Mash in ground barley with 200 ml water at 46°C and mix well with glass rod to prevent formation of lumps. Carefully rinse glass rod and wall of beaker with small quantity of water. Promptly place mash beaker in mashing apparatus containing water previously heated to 46°C and set the stirrer in motion. Place thermometer in the mash beaker. Keep temperature at 45°C exactly for 30 minutes from the time the beaker was placed in the mashing apparatus. Raise mash temperature at the rate of

" 1°C per minute till it reaches 70 to 71°C and mash for 60 minutes at 70°C . Care should be taken that temperature deviations during mashing procedure do not exceed 0.5°C .

C.2.3. Cooling and Filtration

After 60 minutes, cool mash promptly (within 10 to 15 minutes) to the prevailing room temperature. Stop stirring. Remove thermometer after adhering mash particles are rinsed into the beaker with water. Remove the beaker with it stirrer from the mashing apparatus. Rinse mash particles adhering to the stirrer into beaker with water. Dry outside of the beaker taking care to remove the moisture adhering to the rim. Without delay adjust the mass of contents of mash beaker to $450.00 \pm 0.5\text{ g}$ by adding water.

Stir mash thoroughly with glass rod, once when removing the beaker from balance pan and again immediately before pouring mash into filter (stiring shall be not less than 5 minutes and not more than 15 minutes part) while stiring cooled mash, take care to prevent splashing or spilling. Mix drops

adhering to beaker wall into mash by rotary stirring with glass rod.

Pour entire contents of beaker into funnel provided with specified filter paper. Cover funnel with approximately 20 cm diameter watch-glass during entire filtration. In case of slow running works, stop filtration after 2 hours. In case of coarse ground malt mash collect exactly 200 ± 2 ml wort. When filtration is complete mix wort in receiving flask thoroughly by rotary motion. Speed of filtration is normal if filtration is complete within one hour after returning the filtrate to filter bed; slow if filtration takes longer.

C.2.4 Specific gravity.

Rinse empty pycnometer twice with about 10 ml wort. Fill with wort, place in water bath maintained at 20°C. Weigh filled pycnometer within 3 hours of completed filtration. Difference between this mass and that of empty pycnometer represents wort capacity of pycnometer at 20°C. Calculate specific gravity of wort to 5 decimal places rounding off to 0.00005 to 0.00010 by dividing mass of wort by mass of water.

C.3 CALCULATION

C.3.1 Determine extract yield of wort by reference to specific gravity values given in table 1.

C.3.2 Calculate yield of extract of barley (on dry basis) as given below

a) Extract as - is basis $P(800 + M)/(100-P)$

where

P = g extract in 100 g wort (as calculated from table 2).

M = percentage moisture in the barley

b) Extract (on dry basis) $=(E \times 100)/(100-M)$

where E = Extract as is basis and M = percent moisture in barley.

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