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Brown rice — Specification

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National foreword

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This Draft Uganda Standard, DUS ARS 859: 2022, *Brown rice — Specification*, is identical with and has been reproduced from an African Standard, ARS 859: 2022, *Brown rice — Specification*, and adopted as a Uganda Standard.

The committee responsible for this document is Technical Committee UNBS/TC 203, *Cereals, pulses and related products and processes*.

Wherever the words, "African Standard" appear, they should be replaced by "Uganda Standard".

Brown rice — Specification

Public Review Draft for comments only — Not to be cited as African Standard



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Foreword

The African Organization for Standardization (ARS) is an African intergovernmental organization made up of the United Nations Economic Commission for Africa (UNECA) and the Organization of African Unity (AU). One of the fundamental mandates of ARSO is to develop and harmonize African Standards (ARS) for the purpose of enhancing Africa's internal trading capacity, increase Africa's product and service competitiveness globally and uplift the welfare of African communities. The work of preparing African Standards is normally carried out through ARSO technical committees. Each Member State interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, Regional Economic Communities (RECs), governmental and non-governmental organizations, in liaison with ARSO, also take part in the work.

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Introduction

Rice is a widely consumed cereal grain in Africa. It is grown from river deltas to mountainous regions and mainly uses rain fed systems. Predicted demands for rice remain strong. In Africa, where rice is the most rapidly growing food source, about 30 million tons more rice will be needed by 2035, representing an increase of 130 % in rice consumption from 2010.

This standard has been developed to take into account:

- a) the needs of the market for the product;
- b) the need to facilitate fair domestic, regional and international trade and prevent technical barriers to trade by establishing a common trading language for buyers and sellers;
- c) the structure of the CODEX, UNECE, USA, ISO and other internationally significant standards;
- d) the needs of the producers in gaining knowledge of market standards, conformity assessment, commercial cultivars and crop production process;
- e) the need to transport the product in a manner that ensures keeping of quality until it reaches the consumer;
- f) the need for the plant protection authority to certify, through a simplified form, that the product is fit for cross-border and international trade without carrying plant disease vectors;
- g) the need to promote good agricultural practices that will enhance wider market access, involvement of small-scale traders and hence making farming a viable means of wealth creation; and
- h) the need to ensure a reliable production base of consistent and safe crops that meet customer requirements.

Brown rice has a higher nutritional value when compared to the milled and polished rice (white rice). With the bran intact, it retains more fibre, folate, iron, riboflavin, potassium, phosphorus, zinc, and trace minerals such as copper and manganese, than other types of rice. Moreover, brown rice is the only form of the grain that contains vitamin E.

Brown rice (husked rice) — Specification

1 Scope

This African Standard specifies the requirements and methods of sampling and test for brown rice of the varieties grown from *Oryza spp.*, intended for human consumption or for further processing. This standard does not apply to parboiled rice

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.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Prepackaged foods — Labelling*

ARS 858, *Rough (paddy) rice — Specification*

CODEX STAN 193, *Codex general standard for contaminants and toxins in food and feed*

ISO 605, *Pulses — Determination of impurities, size, foreign odours, insects, and species and variety — Test methods*

ISO 711, *Cereals and cereal products — Determination of moisture content (Basic reference method)*

ISO 712, *Cereals and cereal products — Determination of moisture content — Routine reference method*

ISO 5984, *Animal feeding stuffs — Determination of crude ash*

ISO 6579, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Salmonella spp.*

ISO 6561-1, *Fruits, vegetables and derived products — Determination of cadmium content — Part 1: Method using graphite furnace atomic absorption spectrometry*

ISO 6561-1, *Fruits, vegetables and derived products — Determination of cadmium content — Part 2: Method using flame atomic absorption spectrometry*

ISO 6633, *Fruits, vegetables and derived products — Determination of lead content — Flameless atomic absorption spectrometric method*

ISO 6639-1, *Cereals and pulses — Determination of hidden insect infestation — Part 1: General principles*

ISO 6639-2, *Cereals and pulses — Determination of hidden insect infestation — Part 2: Sampling*

ISO 6639-3, *Cereals and pulses — Determination of hidden insect infestation — Part 3: Reference method*

ISO 6639-4, *Cereals and pulses — Determination of hidden insect infestation — Part 4: Rapid methods*

ISO 6888-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Technique using Baird-Parker agar medium*

ISO 6888-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 2: Technique using rabbit plasma fibrinogen agar medium*

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ISO 6888-3, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 3: Detection and MPN technique for low numbers*

ISO 7251, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of presumptive Escherichia coli — Most probable number technique*

ISO 16050, *Foodstuffs — Determination of aflatoxin B₁, and the total content of aflatoxin B₁, B₂, G₁ and G₂ in cereals, nuts and derived products — High performance liquid chromatographic method*

ISO 20483, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 21527-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95*

ISO 24333, *Cereals and cereal products — Sampling*

ISO 27085, *Animal feeding stuffs — Determination of calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum, arsenic, lead and cadmium by ICP-AES*

AOAC Official Method 2001.04, *Determination of Fumonisin B₁ and B₂ in corn and corn flakes — Liquid chromatography with immunoaffinity column cleanup*

3 Terms and definitions

For the purpose of this standard the following definitions apply.

3.1

paddy/paddy rice/rough rice

whole or broken kernels of paddy rice from (*Oryza glaberrima*, *Oryza sativa*, *Oryza longistaminata*) retaining its husk after threshing

3.2

husked rice/brown rice/cargo rice

paddy from which only the husk has been removed

NOTE The processes of husking and handling may result in some loss of bran.

3.3

milled rice/white rice

husked rice from which almost all of the bran and embryo (germ) have been removed by milling

3.3.1

undermilled rice

milled rice obtained by milling husked rice, but not to the degree necessary to meet the requirements of well-milled rice

3.3.2

well-milled rice

milled rice obtained by milling husked rice in such a way that most of the bran and part of the embryo have been removed

3.3.3

extra-well-milled rice

milled rice obtained by milling husked rice in such a way that almost all of the bran and the embryo have been removed

3.4

parboiled rice

husked or milled rice processed from paddy or husked rice that has been soaked in water and subjected to a heat treatment so that the starch is fully gelatinized, followed by a drying process

3.5

waxy rice

glutinous rice

varieties of rice whose kernels have a white and opaque appearance

NOTE The starch of waxy rice consists almost entirely of amylopectin. The kernels have a tendency to stick together after cooking.

3.6

whole kernel

husked or milled kernel without any broken part, or part of kernel with a length greater than or equal to nine-tenths of the average length of the test sample kernels

NOTE See Figure 1.

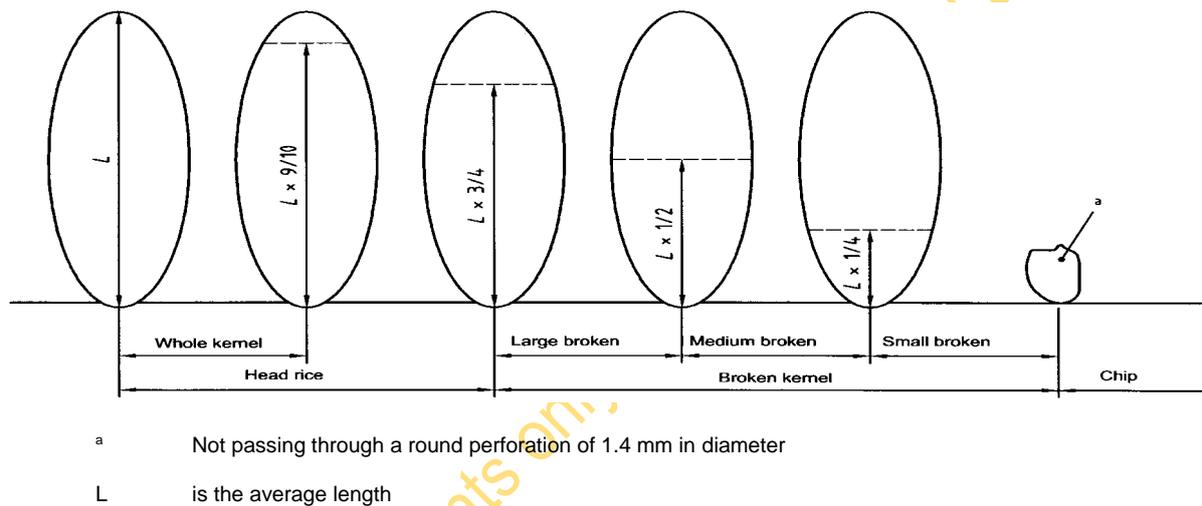


Figure 1 — Size of kernels, broken kernels and chips

3.7

head rice

whole kernel or part of kernel with a length greater than or equal to three-quarters of the average length of the test sample kernels

NOTE See Figure 1.

3.8

broken kernels

pieces of rice that are less than three-quarters of a whole kernel and includes grains of rice in which part of the endosperm is exposed or rice without a germ.

NOTE 1 to entry: If the piece is more than three-quarters of a kernel, it is considered whole

NOTE 2 to entry: See Figure 1.

3.9

medium broken kernel

part of kernel with a length less than or equal to one-half but greater than one-quarter of the average length of the test sample kernels

NOTE See Figure 1.

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3.10

small broken kernel

part of kernel with a length less than or equal to one-quarter of the average length of the test sample kernels but which does not pass through test sieve with round apertures having diameter 1.4 mm

NOTE See Figure 1.

3.11

chip

part of kernel which passes through a test sieve complying with ISO 5223, and with round apertures having diameter 1.4 mm

3.12

average length, L

arithmetic mean of the length of the test sample kernels that are not immature or malformed and without any broken parts

3.13

foreign matter

all organic and inorganic material (such as plant parts, sand, soil, glass, filth) other than brown rice.

3.13.1

inorganic foreign matter

components, such as stone, sand and dust

3.13.2

organic foreign matter

components such as filth, dead insects, rodents and their derivatives and non rice plant matter

3.13.3

filth

impurities of animal origin

3.14

heat-damaged kernel

head rice or broken kernel that has changed its normal colour as a result of microbiological heating

NOTE This category includes kernel that is yellow to dark yellow in the case of non-parboiled rice and orange to dark orange in the case of parboiled rice, due to a microbiological alteration.

3.15

damaged kernel

head rice or broken kernel showing evident deterioration due to moisture, pests, disease or other causes, but excluding heat-damaged kernels

3.16

spotted kernel

whole or broken kernel showing a well defined small circle of dark colour or more or less regular shape

3.17

stained kernel

whole or broken kernel which has undergone on a small area of its surface an obvious change in its natural colour. The stains maybe of different colours e.g., blackish, reddish and brown. Deep black striations are also considered stains.

3.18

specks

head rice or broken kernel of parboiled rice of which more than one-quarter of the surface is dark brown or black in colour due to the parboiling process

3.19

immature kernel

whole or broken kernel which is undeveloped

3.20

shrivelled kernel

kernel which has become shrunken and wrinkled from great heat or lack of moisture

3.21

black kernel

kernel showing a distinctly dark colouration

3.22

over-dried damaged

defective grains caused by overheating during artificial drying. It can be detected where grain is hot, exhibits an unusual odour, exhibits significant sprouting (greater than 10%) or other evidence of weather damage

3.23

smutty rough rice

rough rice which contains more than 3.0 percent of smutty kernels

3.24

immature kernel/malformed kernel

head rice or broken kernel which is unripe or badly developed

3.25

chalky kernel

head rice or broken kernel of non-parboiled rice, except waxy rice, whose whole surface has an opaque and floury appearance

3.26

red kernel

head rice or broken kernel having a red bran covering more than one-quarter of its surface

3.27

red-streaked kernel

head rice or broken kernel with red bran streaks of length greater than or equal to one-half of the average length, but where the surface covered by these red streaks is less than one-quarter of the total surface

3.28

milling yield

estimate of the quantity of whole kernels and total milled rice (whole and broken kernels combined) that are produced in the milling of rough rice to a well-milled degree

3.29

poisonous, toxic and/or harmful seeds

seed which if present may have damaging or dangerous effect on health, organoleptic properties or technological performance such as Jimson weed — *Datura* (*D. fastuosa* Linn and *D. stramonium* Linn.), corn cokle (*Agrostemma githago* L., *Machai Lallium remulenum* Linn.) Akra (*Vicia* species), *Argemone mexicana*, Khesari and other seeds that are commonly recognized as harmful to health shall be absent

3.30

immature kernel

whole or broken kernel, which is undeveloped and may be green in colour

3.30.1

yellow kernel

whole kernel, which has undergone, totally or partially, through heating or other causes, a change in its natural colour and has taken a lemon or orange-yellow tone

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3.30.2

amber kernel

whole kernel, which has undergone thorough heating or other causes, a slight uniform change in colour over the whole surface; this change alters the colour of the kernel to a slight amber-yellow

4 Requirements

4.1 Classification

If rice is classified as long grain, medium grain or short grain, the classification should be in accordance with one of the following specifications. Traders should indicate which classification option is chosen.

OPTION 1: kernel length/width ratio

4.1.1 Long grain rice

- a) Husked rice or parboiled husked rice with a length/width ratio of 3.1 or more.
- b) Milled rice or parboiled milled rice with a length/width ratio of 3.0 or more.

4.1.2 Medium grain rice

- a) Husked rice or parboiled husked rice with a length/width ratio of 2.1–3.0.
- b) Milled rice or parboiled milled rice with a length/width ratio of 2.0–2.9.

4.1.3 Short grain rice

- a) Husked rice or parboiled rice with a length/width ratio of 2.0 or less.
- b) Milled rice or parboiled milled rice with a length/width ratio of 1.9 or less.

OPTION 2: The kernel length

4.1.4 Long grain rice

Long grain rice has a kernel length of 6.6 mm or more.

4.1.5 Medium grain rice

Medium grain rice has a kernel length of 6.2 mm or more but less than 6.6 mm.

4.1.6 Short grain rice

Short grain rice has a kernel length of less than 6.2 mm.

OPTION 3: A combination of the kernel length and the length/width ratio

4.1.7 Long grain rice

Long grain rice has either:

- a) a kernel length of more than 6.0 mm and with a length/width ratio of more than 2 but less than 3, or;
- b) a kernel length of more than 6.0 mm and with a length/width ratio of 3 or more.

4.1.8 Medium grain rice

Medium grain rice has a kernel length of more than 5.2 mm but not more than 6.0 mm and a length/width ratio of less than 3.

4.1.9 Short grain rice

Short grain rice has a kernel length of 5.2 mm or less and a length/width ratio of less than 2.

4.2 Raw material

The rough rice from which the brown rice is obtained shall be of sound quality, free from sand, have characteristic odour and flavour complying with ARS 858.

4.3 General requirements

Brown rice shall meet the following general requirements/limits as determined using the relevant standards listed in Clause 2 shall be;

- a) the dried mature grains of edible *Oryza spp*;
- b) clean, wholesome, uniform in size, colour and shape;
- c) safe and suitable for human consumption;
- d) free from abnormal flavours, musty, sour or other undesirable odour, obnoxious smell and discolouration;

4.4 Specific requirements

4.4.1 Grading

Brown rice shall comply with maximum limits given in Table 1 when tested in accordance with the test methods specified therein.

Table 1 — Specific requirements

S/N	Characteristics	Permissible limits			Test method
		Grade 1	Grade 2	Grade 3	
(1)	Head rice, % m/m, min.	84.0	79.0	75.0	ISO 605
(2)	Broken, %, m/m max	2.0	6.0	8.0	ISO 605
(3)	Heat damaged rice, m/m %, max	1.5	1.5	2.0	
(4)	Damaged rice, %, m/m max	1.0	2.5	4.0	
(8)	Chalky kernels, % m/m max.	2.0	4.0	6.0	
(9)	Red or red streaked, %, m/m max.	2.5	4.0	10	
(10)	Green/immature grains, %, m/m max	2.0	6.0	8.0	
(11)	Other contrasting varieties, % m/m max	1.0	2.0	5.0	
(12)	Foreign matter, %, m/m max	0.2	0.6	0.6	
	Organic matter, %, m/m max	0.1	0.5	0.5	
(13)	Inorganic matter, %, m/m max	0.1	0.1	0.1	
(14)	Live weevils, number/kg,	Nil	Nil	Nil	
(15)	Filth, %, m/m max	0.1	0.1	0.1	
(16)	Paddy grains, %, m/m max.	1.0	2.0	2.5	
(17)	Moisture content, %, m/m max	14.0	14.0	14.0	ISO 712
(18)	Total aflatoxin (AFB1+AFB2+AFG1 +AFG2)), ppb, max	10			ISO 16050
(19)	Aflatoxin B1 only, ppb, max	5			
(20)	Fumonisin, ppm, max	2			AOAC 2001.04

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5 Contaminants

5.1 Heavy metals

Brown rice shall comply with those maximum limits for metal contaminants specified in CODEX STAN 193.

5.2 Pesticide residues

Brown rice shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity

6 Hygiene

Brown rice shall be produced and handled under hygienic conditions in accordance with ARS 53 and shall comply with the microbial limits given in Table 2 when tested in accordance with the test methods prescribed therein.

Table 2 — Microbiological limits

S/No.	Type of micro-organism	Limits	Test method
(1)	Yeasts and moulds, per g max.	10 ²	ISO 21527-2
(2)	<i>S. aureus</i> per 25 g max	10 ³	ISO 6888
(3)	<i>E. coli</i> , per g	Absent	ISO 7251
(4)	<i>Salmonella</i> , per 25 g	Absent	ISO 6579

7 Packaging

Brown rice shall be packed in food grade packaging material, which will safeguard the hygienic, nutritional and organoleptic qualities of the products. Each package shall be securely closed and sealed.

8 Weights and measures

Brown rice shall be packaged in accordance with the weights and measures regulations of the destination country.

NOTE Maximum package weight of 50 kg where human loading and offloading is involved'

9 Labelling

9.1 The following specific labelling requirements shall apply and shall be legibly and indelibly marked in accordance with the requirements of ARS 56:

- (i) product name as "Brown Rice";
- (ii) variety;
 - Long grain brown rice
 - Medium grain brown rice

- Short grain brown rice
 - Mixed brown rice
- (iii) grade;
- (iv) name, address and physical location of the producer/ packer/importer;
- (v) lot/batch/code number;
- (vi) net weight, in kg;
- (vii) the declaration “Food for Human Consumption”
- (viii) storage instruction as “Store in a cool dry place away from any contaminants”;
- (ix) crop year;
- (x) packing date;
- (xi) instructions on disposal of used package;
- (xii) country of origin;
- (xiii) a declaration on whether the brown rice was genetically modified or not.

10 Sampling

Sampling shall be done in accordance with the ISO 24333.

Bibliography

United States Standards for Brown Rice for Processing, Updated July 2005

ISO 7301:2011, *Rice — Specification*

CODEX STAN 198-1995, *Standard for Rice*

ISO 5223, *Test sieves for cereals*

ISO/TS 8000-1:2011, *Data quality — Part 1: Overview*

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