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**Instant Blended Biofortified Orange
Fleshed Sweetpotato (OFSP) flour—
Specification**

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Reference number

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 647 was prepared by Technical Committee RSB/TC 22, *Nutrition and Foods for Special Dietary Uses*.

Committee membership

The following organizations were represented on the Technical Committee on *Nutrition and Foods for Special Dietary Uses* (RSB/TC 22) in the preparation of this standard.

ISHYO FOODS Ltd

MINIMEX Ltd

North Star Food Systems Consulting

Rwanda Food and Drugs Authority (Rwanda FDA)

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

SOSOMA Ltd

University of Rwanda, College of Agriculture, Forestry and Food Science (UR-CAFF)

World Food Programme (WFP)

Rwanda Standards Board (RSB) – Secretariat

Instant blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour— Specification

1 Scope

This Draft Rwanda Standard specifies requirements, sampling and test methods for instant blended flour primarily obtained from the processing of Biofortified Orange Fleshed Sweetpotato from varieties of *Ipomoea batatas* Lam intended for human consumption.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

AOAC 925.10, *Solids (Total) and moisture in flour— Air oven method*

AOAC 965.22, *Sorting corn grits— Sieving method.*

AOAC 999.11, *Lead, Cadmium, Copper, Iron and Zinc in Foods—Atomic absorption Spectrophotometry after dry ashing*

ISO 23719, *Cereals and cereal products — Determination of 17 mycotoxins by ultra-high-performance liquid chromatography and tandem mass spectrometry method (UHPLC-MS/MS)*

RS CXS 192, *General standard for food additives*

RS EAS 38, *Labelling of pre-packaged foods — General requirements*

RS EAS 744, *Cassava and cassava products— Determination of total cyanogens — Enzymatic assay method*

RS EAS 900, *Cereals, pulses and their products — Sampling*

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

RS ISO 16649-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of beta-glucuronidase-positive Escherichia coli Part 2: Colony-count technique at 44 degrees C using 5-bromo-4-chloro-3-indolyl beta-D-glucuronide*

RS 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*

RS ISO 2171, *Cereals, pulses and by-products — Determination of ash yield by incineration*

RS ISO 4833-1, *Microbiology of the food chain — Horizontal method for the enumeration of microorganisms Part 1: Colony count at 30 °C by the pour plate technique*

RS ISO 5498, *Agricultural food products — Determination of crude fibre content — General method*

RS ISO 5506, *Soya bean products — Determination of urease activity*

RS ISO 5985, *Animal feeding stuffs — Determination of ash insoluble in hydrochloric acid*

RS ISO 6579-1, *Microbiology of the food chain — Horizontal method for the detection, enumeration and serotyping of Salmonella Part 1: Detection of Salmonella spp.*

RS ISO 9648, *Sorghum — Determination of tannin content*

3 Terms and definitions

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

3.1

Biofortified Orange Fleshed Sweetpotato (OFSP)

nutritious biofortified root crop obtained from a plant of the *Ipomoea batatas* (L.) Lam that is conventionally bred to contain high levels of beta-carotene

3.2

Biofortified Orange Fleshed Sweetpotato flour

flour obtained from OFSP as defined under 3.1

3.3

Blended Biofortified Orange Fleshed Sweetpotato (OFSP)

product obtained by blending OFSP with other food plants and or their products or grains/seeds

3.4

instant blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour

blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour subjected to heat treatment process to the extent of being a ready to be used food product without further cooking

3.5

foreign matter

organic and inorganic materials (such as sand, soil and glass) other than extraneous matter

3.6

extraneous matter

organic matter of plant origin other than the OFSP flour

3.7

food grade packaging material

packaging material, made of substances which are safe and suitable for their intended use and which will not impart any toxic substance or undesirable odour or flavour to the product

4 Requirements

4.1 Ingredients

4.1.1 Essential ingredients

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall be manufactured from the following essential ingredient complying with relevant standard:

- a) Biofortified Orange Fleshed Sweetpotato complying with DRS 638;

4.1.2 Optional ingredients

Optional ingredients which may be used in the manufacture of Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall comply with relevant standards. They include but are not limited to the following:

- a) Soybean grains; and
- b) Sugar.

4.2 General requirements

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall:

- a) exhibit a uniform characteristic colour;
- b) be free from off-flavours and odours;
- c) be homogeneous;

- d) be practically free from any living insects and foreign matter; and
- e) shall be free from extraneous matter.

4.3 Specific requirements

Instant blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall comply with specific requirements given in Table 1 when tested in accordance with test methods specified therein.

Table 1 — Specific requirements for Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour

S/N	Characteristic	Requirement	Test method
i.	Moisture content, % by mass, max.	5	AOAC 925.10
ii.	Total ash content (on dry matter basis), %, by mass, max.	1	RS ISO 2171
iii.	Crude fibre (on dry matter basis), % by mass, max.	2.0	RS ISO 5498
iv.	Acid insoluble ash (on dry matter basis), % by mass, max.	0.15	RS ISO 5985
v.	Residues on sieving through 600-micron sieve, %, m/m, min.	0.1	AOAC 965.22
vi.	Beta-carotene (provitamin A), mg/100g, min.	3	Annex A
vii.	Water Absorption Index (WAI) % m/m	3.0 - 5.0	Annex B

4.4 Anti-nutritional factors

4.4.1 If soybeans are used as a component of the Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour, urease activity in the instant blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall not exceed 0.3 mg/g per minute and trypsin inhibitor activity shall not exceed 5 mg/g) when tested in accordance with RS ISO 5506.

4.4.2 If sorghum flour is used as a component of the Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour, the tannin content of the Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall not exceed 0.3 % by mass on a dry matter basis when tested in accordance with RS ISO 9648.

4.5 Hydrocyanic acid content

If cassava is used as a component of the Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour, the total hydrocyanic acid content of the instant blended Biofortified Orange Fleshed Sweetpotato flour shall not exceed 10 mg/kg, when tested in accordance with RS EAS 744.

5 Food additives

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour may contain food additives. If used, they shall be in accordance with RS CXS 192.

6 Hygiene

6.1 Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall be prepared and handled in a hygienic manner in accordance with RS CXC 1.

6.2 Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall not exceed microbiological limits specified in Table 2 when tested in accordance with test methods specified therein.

Table 2 — Microbiological limits in Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour

S/N	Micro-organism	Maximum limit	Test method
i.	Total Viable Count, cfu/g, max	10^3	RS ISO 4833-1
ii.	<i>Escherichia coli</i> , cfu/g	Absent	RS ISO 16649-2
iii.	<i>Salmonella spp</i> in 25 g	Absent	RS ISO 6579-1
iv.	<i>Staphylococcus aureus</i> , cfu/ g	Absent	RS ISO 6888-1
v.	Yeasts and moulds, cfu/g, max	10^2	RS ISO 21527-2
vi.	Bacillus cereus, CFU/g, max	50	RS ISO 7932

7 Contaminants

7.1 Pesticide residues

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall comply with maximum residue limits for pesticide residues established by the Codex Alimentarius Commission.

7.2 Heavy metals

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall not exceed maximum levels for heavy metals in table 3 when tested in accordance with test methods specified therein.

Table 3— Maximum Levels for heavy metals in Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour

S/N	Heavy metal	Maximum Level, mg/kg	Test method
i.	Lead (Pb)	0.1	AOAC 999.11
ii.	Cadmium (Cd)	0.1	

7.3 Mycotoxin

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall not exceed maximum levels for mycotoxins in table 4 when tested in accordance with test methods specified therein.

Table 4—Maximum levels for mycotoxins

S/N	Mycotoxin	Maximum Level, µg/kg	Test method
i.	Aflatoxins B1	5	RS ISO 16050
ii.	Total aflatoxin	10	
iii.	Fumonisin	2000	RS ISO 23719

8 Packaging

Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall be packaged in food grade packaging materials that safeguard the hygienic, nutritional, technological and organoleptic qualities of the product.

9 Labelling

9.1 General

9.1.1 In addition to any other requirements of RS EAS 38, the following labelling requirements shall apply and shall be legibly and indelibly marked:

- a) name of the product as “Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour”
- b) micronutrient content eg. Beta-carotene (provitamin A);
- c) list of ingredients in descending order;
- d) name and physical address of the manufacturer/distributor;
- e) instructions for preparation and use;
- f) net content;
- g) country of origin;
- h) batch number;
- i) date of manufacture;
- j) expiry date;

- k) food additives when used;
- l) storage conditions;
- m) allergens declaration
- n) instructions on disposal of used package; and
- o) indication "For human consumption".

8.1.2 When labelling non-retail packages, information for non-retail packages shall either be given on the packages or in accompanying documents, except that the name of the product, lot identification and the name and address of the manufacturer or packer shall appear on the packages.

9.2 Nutritional labelling and health claims

8.2.1 Nutritional labelling shall be done in accordance with RS EAS 803.

8.2.2 Nutritional and health claims shall be declared in accordance with RS EAS 804 and RS EAS 805

10 Sampling

Sampling of Instant Blended Biofortified Orange Fleshed Sweetpotato (OFSP) flour shall be done in accordance with RS EAS 900.

Annex A

(normative)

Determination of beta carotene in food by uv-vis spectrophotometric method

A.1 Principle

This method is based on solvent extraction followed by UV-Vis spectrometric detection. The sample is extracted using Acetone, filtered and the filtrate extracted using Petroleum ether, then the concentration of β -carotene is determined by reading the absorbance of standard and sample extract using petroleum ether as blank at 450nm using UV-Visible spectrophotometer.

A.2 Reagents and Apparatus

- a) Acetone, AR grade 99.5% purity
- b) Anhydrous Sodium Sulphate
- c) β -Carotene standard $\geq 93\%$ (UV), powder.
- d) Petroleum Ether, Spectrophotometric grade
- e) Distilled water
- f) UV-Visible spectrophotometer
- g) Blender
- h) 100 ml Volumetric flask
- i) 100ml Beaker
- j) 100 ml Measuring cylinder

A.3 Extraction

A.3.1 Grind sample if it is in grains or pellets form and make sure almost 95% the powder can pass through 1mm sieve. Weigh 0.2-1.0 g of homogenized test portion into blender, then Add 50mls of cold acetone and mix/mill to extract for about 10 minutes.

A.3.2 Filter the sample using whatman filter paper No. 1 to obtain clear filtrate. Wash the residue on the filter paper three times or more until the residuals are white (free from carotenoids).

A.3.3 Transfer the carotenoids extract into separating funnels containing 50ml of petroleum ether and 25 ml of distilled water, and extract by shaking the funnel for about five minutes, then wash the extract using 60mls portions of distilled water until it is free from acetone.

A.3.4 Prepare volumetric flask and glass funnel containing anhydrous dry Sodium Sulphate, pass the carotenoids extract through anhydrous Sodium Sulphate to dry it. Rinse the separating flask, Sodium Sulphate and funnel using petroleum ether but taking care not to exceed the mark of the volumetric flask.

A.4 Determination

A.4.1 Prepare 100µg/ml working standard solution from stock β-carotene standard, then prepare calibration standards by diluting it serially to obtain 0, 2, 4, 8, 16, 32, 64µg/ml beta carotene by taking appropriate volume of working standard solution into volumetric flask and diluting it with petroleum ether into 100ml volumetric flask.

A.4.2 Read the absorbance of standards and sample extract using petroleum ether as blank at 450nm using UV-Visible spectrophotometer. Use standard concentrations and the obtained absorbance to construct a standard calibration curve, from the curve obtain equation and calculate the beta carotene concentration in the samples

A.5 Calculation

$$\beta - \text{Carotene concentration } (\mu\text{g/ml or } \mu\text{g/g}) = \frac{(A \pm K) \times V1}{M \times \text{Sp wt}}$$

where

A = Sample absorbance

K = Y-intercept of the standard calibration curve

V1 = Total volume of the sample extract

M = Slope of the standard plot

Sp wt. = Amount of sample taken for analysis

Annex B (normative)

Determination of the water absorption index (WAI) and the water solubility index (WSI)

B.1 Principle

B.1.1 The hydration capacity of raw materials for extrusion as well as semi-finished products and finished extrudates is an essential quality criterion. On average, the proteins bind water in a weight ratio of 2:1 to 1:10. The water binding properties are influenced by several internal factors and external parameters.

B.1.2 Determination of the water absorption index (WAI) and the water solubility index (WSI) is a descriptive characteristic used for the processing of legumes and cereals. For extrusion, it is an inexpensive method because it can be used to characterise raw materials and end products. During extrusion, it determines the amount of water required to be added to the raw materials. For extrudates, it is a sensory characteristic that describes the solubility and mouthfeel when consumed.

B.1.3 The water solubility index (WSI) is the quotient of the mass of the dried residue to the mass of the sample in percent. The water absorption index (WAI) denotes the mass of the gel per gram of dry material in percent.

B.2 Sample preparation

The extrudates are crushed in the laboratory mill (Fa. Retsch), which is equipped with a 2.0 mm sieve.

B.3 Measurement

B.3.1 The determination of the WSI is based on the Anderson method. For this purpose, 2.5 g per sample is weighed to an accuracy of 0.1 g, relative to the dry mass in a centrifuge tube. Add 30 g DE water, tempered to 30 °C, and stir the suspension intermittently with a glass rod. After 30 min, the samples are centrifuged for 10 min at 3500 rpm in a Hettich centrifuge model EBA 12.

B.3.2 The supernatant liquid is then decanted in evaporation dishes, placed on a hotplate and evaporated. After evaporation, the evaporating trays are placed in a drying oven at 105 °C for 90 minutes. After the drying process, the trays are cooled in a desiccator and after 30 minutes weighed to three decimal places. The skins are dried for a further 60 minutes and cooled for 30 minutes. Then the dried samples are weighed again to check whether they have reached a constant initial weight. For this, a deviation of 0.1 g must not be exceeded.

B.3.3 The gel remaining in the centrifuge tubes is weighed (mGel) and used to determine the WAI.

B.4 Calculation

B.4.1 Calculation of the initial weight:

$$E_{TM} [g] = \frac{2,5 \text{ g} \times 100 \%}{100 \% - F}$$

with F = moisture content

B.4.2 The WSI is calculated with follows:

$$WSI [\%] = \frac{100 \% \times m_{gR}}{E}$$

with m_{gR} = mass of dried residue

E = initial weight

B.4.3 Determination of water absorption index (WAI)

B.4.3.1 The WAI is a calculation value. When determining the WSI, centrifugation separates into 2 phases: the supernatant liquid and the remaining gel from the insoluble components. For the determination of the WAI, the masses of these fractions are offset against each other. The water absorption index (WAI) is the quotient of the gel weight to the residual sample weight after deducting the amount of dried residue.

B.4.3.2 The WAI is expressed in mass of gel per gram of dry material. The determination of the WAI depends on the WSI and is carried out simultaneously.

B.4.3.3 The WAI is calculated as follows:

$$WAI [g/g] = \frac{m_{Gel}}{E - m_{gR}}$$

with m_{Gel} = mass of gel after centrifugation

m_{gR} = mass of dried residue

E = initial weight

Bibliography

- [1] FDRS 436: 2026 Instant fortified whole maize flour— Specification
- [2] Schneeweiß, R. (2018) Determination of the water absorption index (WAI) and the water solubility index (WSI). Developed by the EU-H2020 project TRUE ('Transition paths to sustainable legume-based systems in Europe'), funded by the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement Number 727973.

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