



Technical Specifications for RICE – Fortified – 25% Broken

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1. PREFACE

1.1 Scope of this document

This specification applies to **Fortified Rice with 25% broken kernels**, as defined below, that WFP purchases and distributes to beneficiaries.

1.2 Usage of this document

This specification constitutes the description of product and processes related to the food **Fortified Rice with 25% broken kernels** as purchased by WFP. All **Fortified Rice with 25% broken kernels** purchased by WFP shall conform to this specification unless otherwise stipulated per contract.

1.3 Product purpose

Fortified Rice is a more nutritious substitute for standard milled rice varieties. Enriched with essential vitamins and minerals, **Fortified Rice** will be used in WFP supplemental nutrition programmes where rice is a staple food.

1.4 Glossary

Rice: *Oryza sativa* in any form.

Paddy: Rice kernels that are still in the inedible husk (lemma) also called “rough rice”. **Brown rice:** Rice kernels with husk removed by milling (caryopsis).

White rice: Polished rice kernels with the husk, bran and germ removed by milling (endosperm). **Kernel part:** 10% the length of a rice kernel.

Chalky kernel: Rice kernel that wholly or partially has a chalky, non-transparent appearance. **Immature kernel:** Whole or broken rice kernel that is unripe or undeveloped.

Yellow kernel: Whole or broken white rice kernel that has turned wholly or partially yellow. This includes parboiled rice kernels that have turned partially or wholly light brown.

Red kernel: Whole or broken white rice kernel with a red-coloured pericarp (bran) covering 2.5 parts (25.0%) or more of the surface.

Broken kernel: Piece of a rice kernel with length less than 7.5 parts (75.0%) of whole rice kernel.

Damaged kernel: Kernel that is obviously damaged to the naked eyes due to moisture, heat, fungi, insects or other.

Foreign material: Matter other than rice, including husk and bran detached from rice kernels. **Reasonably well milled:** Bran has been largely removed from the rice kernel.

Vitamin and mineral premix kernels: Extruded rice product that is fortified and has the appearance of a rice kernel. Also known as “fortified kernel” and “micronutrient kernel”.

1.5 References

- Origin country regulatory requirements
- Recipient country regulatory requirements
- Good Manufacturing Practices (GMP) of food products
- “Recommended International Code of Practice: General Principles of Food Hygiene (CAC/RCP 1-1969)”
- CAC/RCP 1-1969 Rev 3 1997 Amended (1999) including Annex “Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its application”
- Food Safety Management System; ISO 22000

2. SPECIFICATION

2.1 General requirements

Fortified Rice with 25% broken kernels shall be composed of rice mixed homogeneously with extruded vitamin and mineral premix kernels that mimic the physical characteristics of the rice. When tested by appropriate methods of sampling and examination fortified rice:

- Shall be free from objectionable matter the extent possible using good manufacturing practice
- Shall be free from micro-organisms in amounts which may represent a hazard to health
- Shall be free from parasites which may represent a hazard to health
- Shall not contain any substance originating from micro-organisms, including fungi, in amounts which may represent a hazard to health
- Shall not be irradiated in amounts which may represent a hazard to human health
- Shall be free from heavy metals in amounts which may represent a hazard to human health
- Shall not contain more than 5 ppb Ochratoxin A or 20 ppb Total Aflatoxins
- Shall be fresh, free from abnormal flavours, odours, live insects and otherwise fit for human consumption and intended purpose.

2.2 Raw materials

Raw materials for **Fortified Rice with 25% broken kernels** include: 25% broken, reasonably well milled white rice and vitamin and mineral premix kernels. All raw materials must be fresh, of good quality, free from foreign materials and substances hazardous to health, must comply with all relevant food laws and standards. Raw materials must be stored under dry, ventilated and hygienic conditions. For agricultural products, only safe insecticides (*i.e.* phosphine) may be used for fumigation control. Where needed, fumigation must be performed by certified operators.

Rice

- Must conform to Codex Standard 198-1995

Vitamin and mineral premix kernels

- Must conform to ANNEX I

2.3 Processing

The **Fortified Rice with 25% broken kernels** Supplier must implement a HACCP plan specific to the type of product and specific to the environment of production and the process (including Critical Control Points – CCP’s, critical limits, and corrective actions). Other principles such as Strict zoning plan, Environmental Monitoring plan and other ISO 22000 related principles shall be implemented where possible.

Fortified Rice with 25% broken kernels is prepared by blending rice kernels with vitamin and mineral premix kernels. The vitamin and mineral premix kernels should be homogeneously blended into the rice at a ratio of 1:100 (e.g. 1kg of Fortified vitamin and mineral premix kernels to 100kg of milled rice) with a [CV](#) of no more than 14%.

2.4 Nutritional Value

Freshly produced **Fortified Rice with 25% broken kernels** shall comply with the nutritional requirements in Table 1.

Table 1: Micronutrient content of finished Fortified Rice with 25% broken kernels

Nutrient	Minimum mg/100g finished Fortified Rice	Maximum per mg/100g finished Fortified Rice	Per 100g for Labelling
Vitamin A	500 IU	667 IU	500 IU
Vitamin B1	0.5 mg	1.0 mg	0.5 mg
Vitamin B3	7.0 mg	10.0 mg	7.0 mg
Vitamin B6	0.6 mg	1.2 mg	0.6 mg
Folic acid	0.13 mg	0.25 mg	0.13 mg
Vitamin B12	1.0 mcg	2.0 mcg	1 mcg
Iron	4.0 mg	5.0 mg	4.0 mg
Zinc	6.0 mg	7.0 mg	6.0 mg

3. Packaging and Marking

3.1 Packaging

Bags for **Fortified Rice with 25% broken kernels** must comply with below requirements:

Net weight / volume	Packaging requirements
< 1kg bags	<ul style="list-style-type: none"> - Laminate 60PE/LDPE+12PET or equivalent. - Bags must be clean, sound and free from insect, fungal infestation. - Bags must be new, uniform, strong, fit for export and multiple handling. - Bags must be well sealed in order to prevent leakage during transport
1 to 5 kg bags	<ul style="list-style-type: none"> - Laminate 80PE/LDPE+12PET or equivalent. - Bags must be clean, sound and free from insect, fungal infestation. - Bags must be new, uniform, strong, fit for export and multiple handling. - Bags must be well sealed in order to prevent leakage during transport
>5 to 50 kg bags	<ul style="list-style-type: none"> - Bags must be made of woven polypropylene (PP) with food grade “ultraviolet” treatment. - Bags must have a heat cut mouth to prevent fibrillation and have sewn, single-fold bottom. - Bags must be closed by double stitching with suitable thread. - Bags must be clean, sound and free from insect, fungal infestation. - Bags must be new, uniform, strong, fit for export and multiple handling. - Construction of fabric must be solid to sustain harsh handling.

- Bags with finished product must pass the drop test (after each drop, there shall be no rupture or loss of contents) following the principles of the drop test standard (EN 277, ISO 7965-2 or equivalent) with following sequence:
 - o Butt dropping: Bag is dropped from a height of 1.20m on the bottom and the top of the bag.
 - o Flat dropping: Bag is dropped from a height of 1.60m twice on one flat face and twice on the opposite flat face.

Two percent empty marked bags (included in the price) must be sent with each lot.

3.2 Marking

Below information must be printed on the bags:

- Name of the food: **Fortified Rice with 25% broken kernels**
- Net weight
- Name of supplier
- Production date
- List of Ingredients: Rice, Vitamins & Minerals
- Country of origin
- Lot identification
- Storage instructions

Additional marking may be required per contract.

3.3 Storage

Fortified Rice must be stored under dry, ventilated and hygienic conditions.

4. SAMPLING AND ANALYTICAL REQUIREMENTS

4.1 Sampling Plan

Fortified Rice will be sampled for analysis by a qualified third party utilizing the following rice sampling standards:

- GAFTA Sampling Rules 124 (01/03/2014 or latest version)

4.2 List of analyses

The principal tests in table 2 must be performed by a qualified third party, appointed by WFP, in order to ensure that **Fortified Rice with 25% broken kernels** meets the necessary quality and safety parameters. Supplier shall also submit a Certificate of Analysis from the manufacturer of the vitamin and mineral premix kernels used in the production of the **Fortified Rice with 25% broken kernels** certifying that the above micronutrient fortification levels are met.

Table 2: Compulsory tests and recommended reference methods for white Fortified Rice 25% broken

No	Tests	Requirements	Reference method (or specified equivalent)
1	Moisture	Max. 14 % (m/m)	ISO 7301
2	Yellow kernels	Max. 1.5 % (m/m)	ISO 7301
3	Red kernels	Max. 7.0 % (m/m)	ISO 7301
4	Chalky kernels	Max. 8.0 % (m/m)	ISO 7301
5	Immature kernels	Max. 1.5 % (m/m)	ISO 7301
6	Paddy kernels	Max. 30 kernels/kg	ISO 7301
7	Damaged kernels	Max. 2.0 % (m/m)	ISO 7301
8	Foreign material	Max. 0.50 % (m/m)	ISO 7301
9	Milling degree	Min. Reasonably well milled	ISO 7301
10	Broken kernels (%)	Min. 25% (m/m)	ISO 7301
11	Organoleptic quality	Natural odour, colour appearance	ISO 7301
12	Average kernel length	As per contractual agreement	ISO 7301
13	GMO (if required)	Negative (<0.9 % of GMO material)	PCR
14	Radiation (if required)	As per contractual agreement	EN 1788
15	Live insect	Nil	ISO 7301
16	Arsenic (inorganic)	Max. 0.2 ppm	AOAC 986.15
17	Cadmium	Max. 0.4 ppm	AOAC 945.58
18	Pesticide residues	http://www.codexalimentarius.net/pestres/data/commodities/details.html?id=158	EN 15662
19	Ochratoxin A	Max. 5 ppb	AOAC 2000.3
20	Vitamin and mineral premix kernels	0.85-1.15% (m/m)	UV-A Lamp

Technical Specifications for Extruded Vitamin and Mineral Premix Kernels

General requirements

Vitamin and Mineral Premix Kernels are a food additive that constitute the fortificant in **Fortified Rice** which is a more nutritious substitute for standard milled rice varieties used in WFP supplemental nutrition programmes where rice is a staple food.

Vitamin and mineral premix kernels used in the production of **Fortified Rice** as purchased by WFP must be made from rice flour, micronutrient premix and any necessary binding, colouring and preservative additives mixed to homogeneity, extruded and dried. The vitamin and mineral premix kernels must conform to shape, size and colour of the rice it is blended with, so that sensory differentiation is difficult. The vitamin and mineral premix kernels must remain viable for at least 12 months when stored up to 30°C at 75% relative humidity. Vitamin and mineral premix kernels are to comply with the nutritional guidelines in Table 3 unless otherwise stated. **Vitamin and mineral premix kernels** shall be fresh, free from abnormal flavours, odours, live insects and otherwise fit for human consumption and intended purpose.

When tested by appropriate methods of sampling and examination **Vitamin and mineral premix kernels**:

- Shall be free from objectionable matter the extent possible using good manufacturing practices
- Shall be free from micro-organisms in amounts which may represent a hazard to health
- Shall be free from parasites which may represent a hazard to health
- Shall not contain any substance originating from micro-organisms, including fungi, in amounts which may represent a hazard to health
- Shall not be irradiated in amounts which may represent a hazard to human health
- Shall be free from heavy metals in amounts which may represent a hazard to human health

Raw materials

Raw materials for **Vitamin and mineral premix kernels** include: rice flour, vitamin and mineral premix, water, and any necessary binding agents, emulsifiers or other food additives. All raw materials must be fresh, of good quality, free from foreign materials and substances hazardous to health, must comply with all relevant food laws and standards. Raw materials must be stored under dry, ventilated and hygienic conditions. For agricultural products, only safe insecticides (*i.e.* phosphine) may be used for fumigation control. When required, fumigation must be performed by certified operators.

Rice Flour

- Made of ground rice conforming to Codex Standard 198-1995

Vitamin and mineral premix

- Must conform to Codex Standard CAC/GL 09-1987 (amended 1989, 1991)
- Must conform to Codex Standard CAC/GL 55-2005
- Chemical forms other than those recommended may have negative impact on kernel color
- Iron source FePP, with Fe content of 25%; particle size $d_{90} < 30$ μm and d_{50} of ~ 7 μm

Other additives

- Any other additives must comply with Codex or relevant regulations

Processing

The **Vitamin and mineral premix kernels** Supplier should implement a HACCP plan specific to the type of product and specific to the environment of production and the process (including Critical Control Points – CCP's, critical limits, and corrective actions). Other principles such as Strict zoning plan, Environmental Monitoring plan and other ISO 22000 related principles shall be implemented where possible.

Nutritional Value

Table 3: Micronutrient content and chemical form of finished vitamin and mineral premix kernel

Nutrient	Unit	Min per kg	Max per kg	Recommended chemical form
Vitamin A	mg	195	312	Vitamin A palmitate or acetate
Vitamin B1	mg	650	975	Thiamin mononitrate
Vitamin B3	mg	9100	10920	Niacinamide
Vitamin B6	mg	780	1170	Pyridoxine hydrochloride
Folic acid	mg	169	254	Folic acid
Vitamin B12	mg	1.3	2.0	Cyanocobalamin
Iron	mg	4000	4800	Ferric pyrophosphate
Zinc	mg	6000	7200	Zinc oxide
Citrate*	mg	45000	54000	Trisodium citrate dihydrate
Citric acid*	mg	1600	1920	Citric acid

*Chelating Agent

- These components constitute a citrate buffer that will act as a chelating agent in the premix to improve the bioavailability of iron in the final product
- A citrate buffer with a pH of 6-7 composed of: 45mg Trisodium citrate dihydrate and 1.6mg Citric acid to every 4mg of iron

Additional Instructions

The **Vitamin and mineral premix kernel** Supplier should receive a Certificate of Analysis of the micronutrient premix, from the micronutrient premix supplier at the time of procurement. They should also regularly collect samples at the time of production to analyse for required amounts and uniformity of micronutrient content in the kernels.

Supplier should use food-grade packaging that ensures product quality and includes producer name, date of production, lot number, best-before date and ingredients.

A Certificate of Analysis for the finished **Vitamin and mineral premix kernels** from an accredited lab should be given to the buyers at time of sale.