



Technical Specifications for

VITAMIN AND MINERAL PREMIX KERNELS

Commodity Code: **CERFRK000**

Version: **1, adopted 2018**

Replacing: **Version 16, adopted 2016 (annex)**

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This version replaces annex-1 of the ver. 16, 23/02/2016

The adjustments are:

1. Separation of specification from Rice-Fortified-25% Broken

2. Analytical requirements for Vitamin and Mineral Premix Kernels

1. SCOPE

This specification applies to **Vitamin and Mineral Premix Kernels**, they are blended with rice in order to fortify it, before distributing to beneficiaries.

2. PRODUCT TYPE

Vitamin and Mineral Premix Kernels consists of off-white to pale yellow free flowing pellets/kernels that contains high concentration of vitamins and minerals. These kernels are intended for reconstitution into fortified rice by blending with conventional rice. Vitamin and Mineral Premix Kernels also known as Fortified Rice Kernels.

3. PRODUCT PURPOSE

Vitamin and Mineral Premix Kernels are a food additive that constitutes the fortificant in **Fortified Rice**. It is a processed rice product that is fortified and has the appearance of a rice kernel. It is also known as “fortified kernel” and “micronutrient kernel”. Acceptable technologies for the production of this product include hot extrusion, cold extrusion or coating, provided that evidence that supports that the product meets the nutritional and safety requirements as specified in the technical specifications for **Vitamin and Mineral Premix Kernels** is made available. Fortification of rice that uses dusting technology is not acceptable, as the resulting fortified rice does not withstand pre-washing or decanting of excess water, steps in the preparation process in many of the target countries where the fortified rice will be used. **Vitamin and Mineral Premix Kernels** are to be blended with milled rice in a ratio that ensures the nutritional requirements are met as outlined in Table 1. The recommended mixing ratio is of 1:100 (99% milled rice mixed with 1% of fortified rice kernels) and assumes a rice consumption level of 150-300 g/capita/d, in which case the fortified rice provides approximately 1 estimated average requirement (EAR) of adults of the added micronutrients.

4. DEFINITIONS

Rice: *Oryza sativa* in any form.

White rice: Polished rice kernels with the husk, bran and germ removed by milling (endosperm).

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.

Fortified rice: More nutritious substitute for standard milled rice varieties. It is enriched with essential vitamins and minerals, **Fortified Rice** is used in WFP programmes where rice is a staple food.

Micronutrient premix: Mix of micronutrients ready to be used in the production of Vitamin and mineral premix kernels.

Rice flour: Flour made of finely milled rice.

5. REFERENCES

- WHO Guideline 2018: Fortification of rice with vitamins and minerals as a public health strategy
- Recipient country regulatory requirements
- Good Manufacturing Practices (GMPs) of food products
- "Recommended International Code of Practice: General Principles of Food Hygiene (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
- WFP Technical Specifications for Fortified Rice 25% broken (CERRIC100)

6. SPECIFICATION

6.1 General requirements

Vitamin and mineral premix kernels are composed of rice grain or rice flour, micronutrient premix and any necessary additives. Using hot/cold extrusion or coating technology, the final formulation for vitamin and mineral premix kernels must be processed into a product that delivers micronutrients as specified; and whose final attributes (shape, color, density, etc) are similar to the white rice that they will be blended with.

Vitamin and mineral premix kernels shall be fresh, free from abnormal flavours, odours, live insects and otherwise fit for human consumption and intended purpose. This product is recommended to be blended in a 1:100 ratio with white rice as per the specification for the production of **Fortified Rice** as purchased by WFP, for example 99% milled rice mixed with 1% of fortified rice kernels. Equivalent mixing ratios are acceptable as long as micronutrient content requirements are met as per the fortified rice specification. When tested by appropriate methods of sampling and examination freshly produced vitamin and mineral premix kernels shall:

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

6.2 Raw materials

Raw materials for **Vitamin and mineral premix kernels** include: rice or rice flour depending on whether hot/cold extrusion or coating technology were used for the production process, vitamin and mineral premix, various additives also depending on the process (i.e. chelating agent, binding agent, emulsifiers or colorants) and water. 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 (see below) may have negative impact on kernel color
- If the Iron source is Ferric Pyrophosphate (FePP), with Fe content of 25%; particle size shall be of d90 < 35 mcm and d50 of ~7 mcm.

Other additives

- Any other additives must comply with The Food Chemical Codex, the Codex Alimentarius and/or relevant regulations

6.3 Processing

Vitamin and mineral premix kernels must be the result of a process that delivers micronutrients as specified in a product whose final attributes, flavour, shape, size and colour, are similar to the white rice that it will be mixed into.

The **Vitamin and mineral premix kernels** supplier shall 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.

6.4 Nutritional Value

Freshly produced Vitamin and mineral premix kernels shall comply with the nutritional requirements in Table 1 or national regulations if they exist.

Table 1: 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	Thiamine mononitrate
Vitamin B3	mg	9100	10920	Niacinamide
Vitamin B6	mg	780	1170	Pyridoxine hydrochloride
Folic acid	mg	169	253.5	Folic acid
Vitamin B12	mg	1.3	1.95	Cyanocobalamin
Iron	mg	4000	4800	Ferric pyrophosphate
Zinc	mg	6000	7200	Zinc oxide
Citrate*	mg	35000	54000	Trisodium citrate dihydrate
Citric acid*	mg	1300	1920	Citric acid

*Chelating Agents

- 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 at least: 35mg Trisodium citrate dihydrate and 1.3mg Citric acid to every 4mg of iron

6.5 Shelf life

The **Vitamin and Mineral Premix Kernels** retain the above qualities for at least 12 months from the date of manufacture when stored up to 30°C at 75% relative humidity. Appropriate overage should be used to compensate for potential micronutrient loss over due to storage and packaging conditions.

7. PACKAGING

Supplier should use food-grade packaging that ensures product quality over specified time. 25kg compound Kraft bag lined with PE bag is recommended.

7.1 Packaging

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:

- Butt dropping: Bag is dropped from a height of 1.20m on the bottom and the top of the bag.
- 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

7.2 Marking

Below information must be printed on the bags:

- Name of the food product: Vitamin and Mineral Premix Kernels
- Net weight
- Name of supplier
- Production date
- Best before date
- List of Ingredients
- Nutrient content (nutrient and amount per kg)
- Country of origin
- Lot/batch identification
- Storage instructions
- Recommended blended ratio of fortified kernels in fortified rice (product is to be blended at 1:100 ratio with white rice before consumption (99% rice and 1% fortified rice kernel).
- Additional marking may be required per contract.

8. STORAGE

The **vitamin and mineral premix kernels** must be stored under dry, ventilated and hygienic conditions away from heat and sunlight, oil, odorous and toxic materials. The area must have pest control program in place to prevent rodent and insect infestation.

9. ANALYTICAL REQUIREMENTS

9.1 Specific Instructions

The **Vitamin and mineral premix kernel** supplier should obtain a Certificate of Analysis (CoA) 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. The CoA for the finished **Vitamin and mineral premix kernels** from an accredited lab should be given to the buyers at time of sale. It shall contain the minimum analytical requirements in Table 2.

9.2 Compulsory analyses

The principal tests in table 2 must be performed in order to check if the quality of the **Vitamin and Mineral Premix Kernels** meet the above requirements. Additional tests may be defined in case of further quality assessment is required as per contract.

Table 2: List of compulsory tests and reference methods

No	Test	Requirements	Reference method (or specified equivalent)
1	Organoleptic quality	Characteristic shape, colour, odour, free flowing kernels in appearance,	ISO 7301
2	Moisture	14% Max	ISO 7301
3	Vitamin A	195-312 (mg/kg)	AOAC 2011.15
4	Vitamin B1	650-975 (mg/kg)	EN 14122, AOAC 942.23
5	Vitamin B3	9100-10920 (mg/kg)	EN 15653
6	Vitamin B6	780-1170(mg/kg)	AACC 86-90.01
7	Folic acid	169-253 (mg/kg)	AOAC 992.05, AOAC 2004.05
8	Vitamin B12	1.30-1.95 (mg/kg)	AOAC 2011.10
9	Iron	4000-4800 (mg/kg)	AOAC 984.27, AOAC 944.02
10	Zinc	6000-7200 Min (mg/kg)	AOAC 984.27, AOAC 944.02
11	Live insects	Nil	ISO 7301