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BHUTAN STANDARD

Fortified Rice Kernel(s)



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BHUTAN STANDARDS BUREAU

The National Standards Body of Bhutan

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BTS 311:2020

FOREWORD

This Bhutan Standard for Fortified Rice Kernel(s) (FRK) was adopted by Bhutan Standards Bureau after the draft finalized by the Food and Agriculture Technical Committee and approved by the Bhutan Standards Bureau Board on [Day Month](#) 2020.

This standard is subjected to systematic review after five years to keep in pace with the market trends, industrial and technological developments. Any suggestion and further information may be directed to the concerned Technical Committee.

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BHUTAN STANDARD FOR FORTIFIED RICE KERNEL(S)

1 Scope

This standard applies to Fortified Rice Kernel(s) by mixing required micronutrient premix with rice flour, water and permitted food additives followed by application of hot extrusion process.

Fortified Rice Kernel(s) shall not be directly consumed as food.

2 Normative references

The following documents are indispensable for application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including amendments) applies.

ISO 712:2009 (E) *Cereals and cereal products – Determination of moisture content – Reference method.*

AOAC 2001.13 *Determination of vitamin A (Retinol) in foods*

AOAC 957.17 *Thiamine (vitamin B1) in bread*

AOAC 2015.14 *Simultaneous determination of total vitamins B1, B2 B3 and B6 in infant formula and related nutritional*

AOAC 2004.07 *Vitamin B6 in reconstituted infant formula*

AOAC 2014.02 *Vitamin B12 in infant formula and adult/pediatric formulas*

AOAC 2011.10 *Vitamin B12 in infant formula and adult nutritional*

AOAC 2011.09 *Vitamin B12 in infant formula and adult nutritional*

AOAC 2011.14 (ICP) *Calcium, Copper, Iron, Magnesium, Manganese, Potassium, Phosphorus, Sodium, and Zinc in fortified food products*

AOAC 985.35 *Minerals in infant formula, enteral products, and pet foods*

AOAC 999.10 *Lead, Cadmium, Zinc, Copper, and Iron in foods*

AOAC 2015.06 (ICP-MS) *Minerals and trace elements in milk, milk products, infant formula, and adult/pediatric nutritional formula*

AOAC 2011.14 (ICP) *Calcium, Copper, Iron, Magnesium, Manganese, Potassium, Phosphorus, Sodium, and Zinc in fortified food products*

AOAC 985.35 *Minerals in infant formula, enteral products, and pet foods*

AOAC 999.10 *Lead, Cadmium, Zinc, Copper, and Iron in foods*

AOAC 2015.06 (ICP-MS) *Minerals and trace elements in milk, milk products, infant formula, and adult/pediatric nutritional formula*

CODEX STAN 193-1995 amended in 2015 *General standard for contaminants and toxins in food and feed*

BTS 310:2020

BTS 268:2020 CODEX STAN 1-1995 *General standard for the labelling of prepackaged foods*

BTS 139: 2019 SARS 00014: 2018 *Bhutan standard for food Hygiene - General principles - Code of Practice*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply;

3.1 Food additives

Means any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not its nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include 'contaminants' or substances added to food for maintaining or improving nutritional qualities.

3.2 Fortification

The practice of deliberately increasing the content of essential micronutrients in a food so as to improve the nutritional quality of food and to provide public health benefit with minimal risk to health.

3.3 Fortified rice kernel(s)

Extruded rice product that has been fortified with micronutrients and has the appearance of a rice kernel(s).

3.4 Micronutrient

Means essential dietary nutrients (natural or synthesized) including vitamins, minerals or trace elements that are required in very small quantities and are vital to development.

3.5 Micronutrient premix

The blend of micronutrients and diluents formulated to provide specified and determinable amounts of micronutrients.

3.6 Overages

Refers to the additional amount of micronutrients added to the premix/ food to compensate for losses that occur during processing, distribution and storage, which will ensure the fortified food delivers the targeted level of nutrients at the time the food is consumed during its declared shelf life.

3.7 Rice (*Oryza sativa*)

Rice includes cargo rice, white rice, glutinous rice, non-glutinous and boiled rice, whether it is whole grain, head rice, big broken, broken or small broken

3.8 Rice flour

Flour made of milled white rice.

3.9 Shelf life

Means the estimated period during which the food maintains its nutritional, safety and sensory qualities at a specific storage condition. It is based on identified hazards for the product, heat or other preservation treatments, packaging method and other hurdles or inhibiting factors that may be used.

4 Essential composition, safety and quality factors

4.1 General requirement

The fortified rice kernel(s) shall;

- 4.1.1 be fresh, free from abnormal flavour, odour, insect and otherwise fit for intended purpose
- 4.1.2 have attributes such as shape, colour and density similar to rice to be blended with
- 4.1.3 not contain any visual signs of microbial growth
- 4.1.4 conform to organoleptic qualities as given in *table 1* in Annex A.

4.2 Nutritional requirement

The fortified rice kernel(s) shall deliver the requisite level of micronutrients in one or more appropriate conditions of its intended use. For the micronutrients use, it shall conform to *table 2* in Annex B.

4.3 Safety and quality requirement

- 4.3.1 The moisture content of the fortified rice kernel(s) shall be $\leq 14\%$ (m/m). The moisture content shall be determined as per the ISO 712:2009 (E) *Cereals and cereal products – Determination of moisture content – Reference method*
- 4.3.2 The product shall conform to CODEX STAN 193-1995, Amended 2015 *General standard for contaminants and toxins in food and feed*.

4.4 Food additives

The product shall conform to food additives as prescribed in the regulatory requirements.

4.5 Quality assurance

The Fortified Rice Kernel(s) supplier(s) shall obtain Certificate of Analysis (CoA) of micronutrient premix from the supplier at the time of procurement as required by this standard. The CoA shall have the provisions as established;

- 4.5.1 Shall be based on the identified method of analysis for individual micronutrients
- 4.5.2 Shall be from an accredited laboratory with required analytical parameters covered under the scope of accreditation requirements.
- 4.5.3 Shall have provisions to ascertain the purity, quality and assay of micronutrients based on generally accepted references such as Food Chemical Codex, British Pharmacopeia, Indian Pharmacopeia and Joint FAO/WHO Expert Committee on Food Additives (JECFA).

BTS 310:2020

5 Processing

Dough made of rice flour, a micronutrient premix, permitted additives passes through a pre-conditioner where water and steam are added. The dough is then processed through a single or twin-screw extruder and formed into grain-like structures that resemble rice kernels. This process involves relatively high temperatures (70–110°C) obtained by preconditioning and/or heat transfer through steam heated barrel jackets. It results in fully or partially pre-cooked simulated rice kernels that have a similar appearance (sheen and transparency) to regular rice kernels.

The product covered by this standard shall be prepared and handled in accordance with the BTS 139: 2019 SARS 0014:2018 *Bhutan standard on food hygiene- General principles- Code of practice*.

6 Packaging

The product shall be packed in 'fit for purpose' packaging with adequate barrier and strength properties to safeguard hygienic, nutritional and organoleptic qualities during the declared shelf life.

The packaging material shall be safe for intended purpose. It should not impart any toxic substances, undesirable odour or flavour to the product.

7 Marking and labelling

The labelling shall be carried out in accordance with BTS 268:2020 CODEX STAN 1-1985 *General standards for labelling of prepackaged foods*.

8 Storage and shelf life

The Fortified Rice Kernel(s) should 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 the pest infestations.

The Fortified Rice Kernel(s) shall retain the micronutrients as required by clause 4.2 for minimum of 12 months from the date of manufacture when stored up to 25±5 °C (degree Celsius) at 60% relative humidity. Appropriate overages should be used to compensate for potential micronutrient loss due to storage and packaging conditions.

Annex A
(Normative)

Table 1 - Organoleptic qualities

Sl. No.	Tests	Requirement	Reference test methods
1	Appearance	Characteristic kernel shape, length, sheen/transparency and density similar to white milled rice to be blended with	Visual inspection against reference/control sample or as per contractual agreement
2	Colour	Characteristic white or cream colour	-do-
3	Smell/Odour	Pleasant characteristic smell/odour; Free from abnormal odours	-do-

Annex B
(Normative)

Table 2 - Nutritional requirement

Si. No.	Nutrient in mg	Range mg/kg	Recommended chemical form	Reference test method
1	Vitamin A	195 - 312	Vitamin A palmitate or acetate	AOAC 2001.13
2	Vitamin B1	650 - 975	Thiamine mononitrate	AOAC 957.17
3	Vitamin B3	9100 - 10920	Niacinamide	AOAC 2015.14
4	Vitamin B6	780 - 1170	Pyridoxine hydrochloride	AOAC 2015.14
5	Vitamin B9	169 – 253.5	Folic Acid	AOAC 2004.07
6	Vitamin B12	1.3 – 1.95	Cyanocobalamin	AOAC 2014.02; AOAC 2011.10 & AOAC 2011.09
7	Iron	4000 - 4800	Ferric pyrophosphate	AOAC 2011.14 (ICP); AOAC 985.35 and AOAC 999.10 (AAS); AOAC 2015.06 (ICP-MS)
8	Zinc	6000 - 7200	Zinc oxide	AOAC 2011.14 (ICP); AOAC 985.35 and AOAC 999.10 (AAS); AOAC 2015.06 (ICP-MS)

Note 1: 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 if the iron source is ferric pyrophosphate with Fe content of 25%; particle size shall be of d90<35mcm and d50 of equal to 7mcm.

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