

འབྲུག་བཅུད་ཚུལ་གནས་ཚད།

BHUTAN STANDARD

Fortified Rice



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BHUTAN STANDARDS BUREAU

The National Standards Body of Bhutan

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BTS 311:2021

FOREWORD

This Bhutan Standard for Fortified Rice was adopted by Bhutan Standards Bureau after the draft finalized by the Food and Agriculture Technical Committee (TC 02) and approved by the Bhutan Standards Bureau Board (BSB Board) on [Day Month](#) 2020.

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

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Introduction

For Bhutan, micronutrients deficiency or hidden hunger came to prominence due to incidences of peripheral neuropathy and associated sporadic mortality among some school children in December 2011. The reason for this outbreak as reported by an investigation team was inadequate intake of micronutrients belonging to B complex.

Rice as a major staple food for Bhutan, has been selected as a medium to blend with Fortified Rice Kernel(s) (FRK) to form Fortified Rice. The current mixture of 6 vitamins and 2 minerals; B1, B3, B6, B9, B12, Vitamin A, Fe and Zn has been adopted from WFP Technical specifications for Fortified Rice. Fortified Rice kernel(s) are blended with white rice at a ratio of 1:100 to produce fortified rice to supplement the deficit of vitamins and minerals.

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BHUTAN STANDARD FOR FORTIFIED RICE

1 Scope

This standard prescribes the requirements and method of processing for Fortified Rice produced by maintaining an adequate blending ratio between rice and Fortified Rice Kernel(s).

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 nutritionals*

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 nutritionals*

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

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

BTS 313: 2020 *Bhutan Standard on rice - Specification*

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

BTS 310: 2020 *Bhutan Standard for fortified rice kernel.*

3 Terms and definition

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

3.1 Broken kernel

Piece of a rice kernel with length less than 7.5 parts (75%) of whole rice kernel

3.2 Chalky kernel

Rice kernel wholly or partially has a chalky, non-transparent appearance

3.3 Damaged kernel

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

3.4 Discoloured kernel

Rice kernel of which 25% or more of the surface area has become discoloured

3.5 Food hygiene

All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain

3.6 Food safety

Assurance that the food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use

3.7 Foreign material

Matter other than rice, including husk and bran detached from rice kernel, organic and inorganic and extraneous matter

3.8 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

3.9 Fortified rice

Rice that has undergone the process of fortification by blending with Fortified Rice Kernel(s) in an appropriate ratio

3.10 Immature kernel

Malformed kernel head rice or broken kernel which is unripe or badly developed

3.11 Paddy

Rice in its husk after threshing or rice that is not yet dehusked or rice with its husk intact after threshing

3.12 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

3.13 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.

3.14 White rice

Polished rice kernels with husk, bran and germ removed by milling (endosperm)

4 Essential composition, safety and quality factor

4.1 General requirement

4.1.1 The product shall be fresh, free from abnormal flavour, odour, insect and otherwise fit for human consumption and intended purpose

4.1.2 The product shall not contain any visual signs of microbial growth

4.1.3 The product shall conform to organoleptic qualities as given in *table 1* in Annex A.

4.2 Nutritional requirement

The fortified rice shall conform to minimum nutritional requirement as established in *table 2* Annex B for the duration of declared shelf life.

4.3 Safety and quality requirement

4.3.1 The product shall conform to general requirements for rice as established in *table 3* in Annex C

4.3.2 The moisture content of the product 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*

4.3.3 The product shall conform to permissible levels as established in CODEX STAN 183-1995 *General Standard for contaminants and toxins in food and feed or relevant national standards*.

5 Essential composition

5.1 Fortified rice kernel(s) shall be homogenously blended with rice at the ratio of 1:100 (i.e. 1kg of FRK mixed with 99kg milled rice) to meet the nutritional requirements prescribed by this standard. The blend ratio shall be within the permissible tolerance $\pm 15\%$.

6 Raw Materials

6.1 The rice mixed with FRK shall conform to Bhutan Standard for Rice

6.2 The FRK shall conform to Bhutan Standard for Fortified Rice Kernel(s).

7 Processing

The product shall be prepared by blending to conform with requirements established in clause 4.2 and handled in accordance with the BTS 139: 2019 SARS 0014:2018 *Bhutan standard on food hygiene- General principles- Code of practice*.

8 Packaging

The product shall be packed in a 'fit for purpose' packaging with adequate barrier and strength properties to withstand handling and storage during the declared shelf life.

The bags must pass the drop test (after each drop, there shall be no rupture or loss of contents following the principles of the drop test standards as per ISO 7965-2, Sacks-Drop Test-Part 2: *Sacks made from thermoplastic flexible film*).

9 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*.

10 Storage and shelf Life

The fortified rice should be stored under dry, ventilated and hygienic conditions; away from direct heat, sunlight, oil, odorous, toxic and non-food materials. The area must have pest control program in place to prevent pest infestation.

The Fortified Rice shall retain the micronutrients as required by clause 4.2 for a minimum of 12 months from the date of manufacture when stored up to 25 ± 5 °C at 60% relative humidity.

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Annex A

(Normative)

Table 1 - Organoleptic qualities

| S/N | 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 color | -do- |
| 3 | Smell/Odour | Pleasant characteristic smell/odour; Free from abnormal odours | -do- |

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Annex B

(Normative)

Table 2 - Nutritional requirement

| S/N | Nutrient in mg | Range mg/kg | Per 100g for labelling | Reference method |
|-----|-------------------------------|---------------|------------------------|--|
| 1 | Vitamin A, <i>Retinol</i> | 1.95 – 3.12 | 150.0 mcg | AOAC 2001.13 |
| 2 | Vitamin B1, <i>Thiamine</i> | 6.50 – 9.75 | 0.50 mg | AOAC 957.17 |
| 3 | Vitamin B3, <i>Niacin</i> | 91.0 – 109.2 | 7.0 mg | AOAC 2015.14 |
| 4 | Vitamin B6, <i>Pyridoxine</i> | 7.80 – 11.7 | 0.60 mg | AOAC 2015.14 |
| 5 | Vitamin B9, <i>Folic acid</i> | 1.69 – 2.54 | 0.13 mg | AOAC 2004.07 |
| 6 | Vitamin B12, <i>Cobalamin</i> | 0.013 – 0.020 | 1.0 mcg | AOAC 2014.02; AOAC 2011.10 & AOAC 2011.09 |
| 7 | Iron | 40.0 – 48.0 | 4.0 mg | AOAC 2011.14 (ICP); AOAC 985.35 and AOAC 999.10 (AAS); AOAC 2015.06 (ICP-MS) |
| 8 | Zinc | 60.0 – 72.0 | 6.0 mg | AOAC 2011.14 (ICP); AOAC 985.35 and AOAC 999.10 (AAS); AOAC 2015.06 (ICP-MS) |

Annex C

(Normative)

Table 3 - General requirement for fortified rice

| S/N | Tests | Permissible Limits |
|-----|-----------------------|--------------------------------|
| 1 | Discoloured kernel | Max 3%, <i>m/m</i> |
| 2 | Chalky kernels | Max. 7.0%, <i>m/m</i> |
| 3 | Immature kernels | To be covered in chalky kernel |
| 4 | Paddy kernels | Max. 30 kernels/kg |
| 5 | Damaged kernels | Max. 1.5%, <i>m/m</i> |
| 6 | Foreign material | Max. 0.8%, <i>m/m</i> |
| 7 | Milling degree | Min. Reasonably well milled |
| 8 | Broken kernel | Max. 15%, <i>m/m</i> |
| 9 | Average kernel length | As per contractual agreement |

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