

SRI LANKA STANDARD 1804:2024
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**SPECIFICATION FOR
FORTIFIED MILLED RICE**

SRI LANKA STANDARDS INSTITUTION

**Sri Lanka Standard
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SLS 1804:2024

Gr. 6

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Sri Lanka Standard
SPECIFICATION FOR FORTIFIED MILLED RICE

FOREWORD

This Standard was approved by the Sectoral Committee on Agriculture and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2024-05-09.

Fortified rice is an effective intervention to improve the micronutrient status of large segments of the Sri Lankan population with the appropriate levels and forms of micronutrients and with appropriate technology. Decisions about the types and amounts of nutrients to add to fortified rice are commonly based on the nutritional needs and gaps in dietary intake of the target populations; the usual rice consumption level; the sensory and physical effects of the fortificant on the rice kernels; the fortification technology; the availability and coverage of fortification of other staple food vehicles; the population consumption of vitamin and mineral supplements; the costs; the feasibility of implementation; and the acceptability to the consumers. Rice can be fortified with a wide variety of vitamins and minerals, including iron, zinc, vitamins A, B₁ (thiamine), B₃ (niacin), B₆, B₉ (folic acid), B₁₂ and D. At present, there are several methods available for the fortification of rice such as dusting, coating and extrusion. The method chosen depends on the local technology available, costs, washing and cooking practices among a population and other preferences.

This Standard is subjected to the restrictions imposed under Sri Lanka Food Act No. 26 of 1980 and the regulations framed there under and any other regulatory and statutory requirements wherever applicable.

Guidelines for the determination of a compliance of a lot with the requirements of this Standard based on statistical sampling and inspection are given in Appendix A.

All values given in this Standard are in SI units. For the purpose of deciding whether a particular requirement of this Standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with **SLS 102**. The number of significant places retained in the rounded off value should be the same as that of the specified value in the Standard.

In the preparation of this Standard, the valuable assistance obtained from the publications of Codex Alimentarius Commission, European Union, FSSAI, WFP and WHO are gratefully acknowledged.

1 SCOPE

This Standard prescribes the requirements, methods of sampling and methods of test for fortified raw and parboiled milled rice.

2 REFERENCES

- SLS 102 Presentation of numerical values
- SLS 190 Methods for sampling of cereals, pulses and milled products
- SLS 516 Method of test for microbiology of food and animal feeding stuffs
Part 2/ Section 2: Horizontal method for the enumeration of yeasts and moulds - Colony count technique in products with water activity less than or equal to 0.95
Part 5: Horizontal method for the determination of *Salmonella* spp.
Part 12: Horizontal method for the detection and enumeration of presumptive *Escherichia coli*
- SLS 633 Milled rice
- SLS 910 Limits for pesticide residues in food
- SLS 962 Methods of test for aflatoxin in foods
Part 1: Determination of aflatoxin B₁ and the total content of aflatoxin B₁, B₂, G₁ and G₂ in cereals, nuts and derived products – High performance liquid chromatographic method
- SLS ISO 15141 Determination of ochratoxin A in cereals and cereal products –
Part 2: High performance liquid chromatographic method with immunoaffinity column cleanup and fluorescence detection
- Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC), 21st Edition, 2019

3 DEFINITIONS

For the purpose of this Standard, the following definitions shall apply:

- 3.1 coating:** Technology to make fortified kernels. Rice kernels are coated with a fortificant/s mix plus ingredients such as waxes and gums. The micronutrients are sprayed onto the surface of the rice kernels.
- 3.2 commercially objectionable foreign odour:** Odours which are entirely foreign to rice and which, because of their presence render rice unfit for its normal commercial usage.
- 3.3 dusting:** Technology to make fortified rice. Polished milled rice kernels are dusted with a fortificant mix in powder form. These fortified rice does not allow for washing, pre-cooking, or cooking in excess water, since this will wash out the micronutrients.
- 3.4 extrusion:** The continuous thermo-mechanical manufacturing process combines the mixing and cooking of ingredients to produce the same product as rice kernels.
- 3.5 foreign matter:** All matter other than rice (whole or broken) or paddy. Foreign matter includes such things as, dead insects or their fragments, other seeds, fragments of paddy stalk, husk, sand, dust, or any other matter.
- 3.6 fortificants:** Substances or nutrients such as essential vitamins and minerals added to rice during processing to enhance its nutritional value.
- 3.7 fortification:** The practice of deliberately increasing the content of essential micronutrient(s), i.e., vitamins and minerals, in food, so as to improve the nutritional quality

of the food supply and provide a public health benefit with minimal risk to health. The essential micronutrients as food additives are added to make the food more nutritious after postharvest handling.

3.8 fortified rice: Rice with acceptable levels of fortificants by any means of fortification technology.

3.9 germ: Embryo situated at one end of the grain.

3.10 parboiled milled rice: Processed from paddy or husked rice that has been soaked in water and subjected to a heat treatment so that the starch is partially / fully gelatinized, followed by a drying process and the outer coats of the kernel (outer bran) layers have been partially or fully removed.

3.11 raw milled rice: Whole/head grains with or without broken kernels of rice (*Oryza sativa* L.) from which the husk, germ and at least the outer coats of the kernel (outer bran) layers have been partially or fully removed by the milling process.

3.12 sand: A loose siliceous granular material that results from the disintegration of rocks, consists of particles smaller than gravel.

4 TYPES

Types of rice shall be conformed to **SLS 633**.

5 GRADES

Grades of rice shall be conformed to **SLS 633**.

6 INGREDIENTS

6.1 Essential ingredients

6.1.1 *Milled rice*, conforming to SLS 633.

6.1.2 *Iron*

6.1.3 *Folic acid*

6.2 Optional ingredients

6.2.1 *Zinc*

6.2.2 *Vitamin A*

6.2.3 *Thiamine (Vitamin B₁)*

6.2.4 *Riboflavin (Vitamin B₂)*

6.2.5 Niacin (Vitamin B₃)**6.2.6 Pyridoxine (Vitamin B₆)****6.2.7 Vitamin B₁₂****6.2.8 Vitamin D****7 REQUIREMENTS****7.1 General requirements**

7.1.1 Both raw and parboiled milled rice that used for fortification shall conform to the **SLS 633**.

7.1.2 All ingredients, including optional ingredients shall be clean, safe, suitable and of good quality.

7.1.3 After cooking, fortified rice shall not carry any commercially objectionable foreign taste or odour.

7.2 Compositional and nutritional requirements

7.2.1 Iron and folic acid shall comply with the limits given in Table 1, when tested in accordance with the methods given in Column 4.

TABLE 1 - Limits for essential fortificants

Sl No. (1)	Nutrient (2)	Level of fortification per kg (3)	Method of test (4)
i)	Iron	60 mg - 70 mg	AOAC 2011.14 or AOAC 999.11
ii)	Folic acid (Vitamin B ₉)	600 µg - 700 µg	AOAC 2011.06

7.2.2 Rice may be fortified with optional fortificants, singly or in combination. After fortification, the limits shall be complied with the Table 2, when tested in accordance with the methods given in Column 4.

7.2.3 Substances permitted for adding as essential and optional ingredients shall be in accordance with the Annex A.

TABLE 2 - Limits for optional fortificants

Sl No. (1)	Nutrient (2)	Level of fortification per kg (3)	Method of test (4)
i)	Zinc	25 mg - 30 mg	AOAC 2011.14 or AOAC 999.11
ii)	Vitamin A*	2500 IU - 3235 IU	AOAC 2001.13
iii)	Thiamine (Vitamin B ₁)	1.0 mg - 1.6 mg	AOAC 2015.14 or AOAC 986.27 or AOAC 957.17
iv)	Riboflavin (Vitamin B ₂)	1.25 mg - 1.75 mg	AOAC 2015.14 or AOAC 970.65
v)	Niacin (Vitamin B ₃)	12 mg - 25 mg	AOAC 2015.14 or AOAC 961.14
vi)	Pyridoxine (Vitamin B ₆)	1.5 mg - 2.5 mg	AOAC 2015.14 or AOAC 2004.07
vii)	Vitamin B ₁₂	7.5 µg - 12.5 µg	AOAC 2014.02 or AOAC 2011.09 or AOAC 2011.10
viii)	Vitamin D	10 µg - 50 µg	AOAC 2011.12 or AOAC 2011.13

NOTE: *Vitamin A (retinol): 1 IU= 0.3 µg RE (Retinol Equivalent)

7.3 Physical requirements

The product shall be conformed to the requirements specified in **SLS 633**.

7.4 Potentially toxic elements

The product shall not exceed the limits for potentially toxic elements given in Table 3, when tested as in accordance with the method given in Column 4.

TABLE 3 - Limits for potentially toxic elements

Sl No. (1)	Element (2)	Limit (3)	Method of test (4)
i)	Arsenic, as As, mg/kg, max.	0.2	AOAC 2013.06
ii)	Lead, as Pb, mg/kg, max.	0.2	AOAC 2013.06
iii)	Mercury as Hg, mg/kg, max.	0.1	AOAC 2013.06
iv)	Cadmium as Cd, mg/kg, max.	0.2	AOAC 2013.06

7.5 Microbiological requirements

The product shall not exceed the microbiological limits given in Table 4, when tested according to the method prescribed in Column 4 of the Table 4.

TABLE 4 - Microbiological limits

Sl No. (1)	Test organism (2)	Limit (3)	Method of test (4)
i)	<i>Salmonella</i> , per 25g	Absent	SLS 516: Part 5
ii)	<i>E. coli</i> , MPN per g	Absent	SLS 516: Part 12
iii)	Yeast and Mould count, per g, max.	1×10^4	SLS 516: Part 2/ Section 2

7.6 Pesticide residues

The product shall not contain pesticide residues in excess of the limits as prescribed in **SLS 910**.

7.7 Mycotoxin

The product shall not exceed the limits for mycotoxins given in Table 5, when tested in accordance with the method given in the Column 4 of the Table 5.

TABLE 5 - Mycotoxin limits

Sl No. (1)	Mycotoxin (2)	Limit (3)	Method of test (4)
i)	Aflatoxin B ₁ , µg/ kg, max.	2	SLS 962: Part 1
ii)	Total Aflatoxin (B ₁ +B ₂ +G ₁ +G ₂), µg/ kg, max.	4	SLS 962: Part 1
iii)	Ochratoxin A, µg/ kg, max	3	SLS ISO 15141

8 PACKAGING

8.1 Bulk packages

The product shall be packed in clean jute bags, woven polypropylene bags, coarse cloth bags or any other suitable food grade packing materials. The open end of each bag shall be securely stitched.

8.2 Retail packages

The product shall be packed in polyethylene, polypropylene, coarse cloth bags or any other suitable food grade packing materials. The open end of each bag shall be securely stitched/ sealed.

9 MARKING AND/ OR LABELLING

9.1 The following shall be marked or labelled legibly and indelibly on each package:

- a) Name of the product as “Nutrient fortified raw milled rice” or “Nutrient fortified parboiled milled rice”;
- b) Brand name, if any;
- c) Trade mark, if any;
- d) Net mass in g or in kg;
- e) Common name;
- f) Fortificant (s) / Fortificant source / Level of fortification;
- g) Name, address, website (if any) and contact details of manufacturer and packer or distributor in Sri Lanka;
- h) Batch number or code number or a decipherable code marking;
- j) Month and year of processed / milled;
- k) Date of fortification;
- m) Date of expiry;
- n) List of ingredients;
- p) Cooking instructions; and
- q) Storage conditions.

10 SAMPLING

Representative samples from the product for ascertaining conformity to the requirements of this Standard shall be drawn as prescribed in Appendix A.

11 METHODS OF TEST

Tests shall be carried out as prescribed in **SLS ISO 15141, Part 2/ Section 2, Part 5 and Part 12 of SLS 516, Part 1 of SLS 962** and Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC).

12 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this Standard if the following conditions are satisfied:

- 12.1 Each bag examined as in **A.4.1** satisfies the packaging and marking and/ or labelling requirements.
- 12.2 Each bag examined as in **A.4.2** satisfies the relevant requirement.
- 12.3 The composite samples tested as in **A.4.3** satisfy the relevant requirement.
- 12.4 The composite samples tested as in **A.4.4** satisfy the relevant requirements.
- 12.5 The composite samples tested as in **A.4.5** satisfy the relevant requirement

APPENDIX A COMPLIANCE OF A LOT

The sampling scheme given in this Appendix should be applied where compliance of a lot to the requirements of this Standard is to be assessed based on statistical sampling and inspection.

Where compliance with this Standard is to be assured based on manufacturer's control systems coupled with type testing and check tests or any other procedure, appropriate scheme of sampling and inspection should be adopted.

A.1 LOT

In any consignment, all the bags of fortified milled rice of same size, grade, type and name belonging to one batch of manufacture or supply shall constitute a lot.

A.2 GENERAL REQUIREMENTS FOR SAMPLING

In drawing, preparing, storing and handling samples, following precautions and directions shall be observed;

A.2.1 Samples for microbiological analysis shall be drawn aseptically.

A.2.2 Samples shall be drawn in a protected place not exposed to damp, air, dust or soot.

A.2.3 The sampling instruments shall be clean and dry when used. When drawing samples for microbiological examination, the sampling instruments shall be sterilized.

A.2.4 The samples shall be protected against adventitious contamination.

A.2.5 The samples shall be placed in clean and dry containers. The size of the sample containers shall be such that they are almost completely filled by the sample.

A.2.6 The sample containers shall be sealed air-tight after filling and marked with necessary details of sampling.

A.2.7 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the room temperature.

A.3 SAMPLING

Representative samples from the product for ascertaining conformity to the requirements of this Standard shall be drawn in accordance with Clause **5** of SLS **190**.

A.4 NUMBER OF TESTS

A.4.1 Each bag selected shall be examined for packaging and marking and / or labelling requirements given in Clause **8** and **9** of this Standard.

A.4.2 Each bag examined as in **A.4.1** shall be opened and individually examined for the requirements given in Clause **6.1** of **SLS 633**.

A.4.3 Three composite samples shall be prepared as in Clause **5.3** of **SLS 190** for the determination of moisture content, shall be individually tested for moisture content requirement.

A.4.4 The three final composite samples prepared as in **A.3** shall be tested for the requirements given in Table **1** or Table **2** of **SLS 633**.

A.4.5 The remaining material after testing as in **A.4.4** shall be tested for the requirement given in Clause **7.5**.

NOTE: *Test for the requirement given in Clause 7.5 may not be necessary for routine analysis. This test shall be carried out only if required or requested.*

ANNEX A

(Informative)

SUBSTANCES PERMITTED FOR VITAMINS AND MINERALS

Iron	<p>Water soluble</p> <ul style="list-style-type: none"> Ferrous sulfate. 7 H₂O Ferrous sulfate, dried Ferrous gluconate Ferrous lactate Ferrous bisglycinate Ferric ammonium citrate Sodium iron EDTA <p>Poorly water soluble, soluble in dilute acid</p> <ul style="list-style-type: none"> Ferrous fumarate Ferrous succinate Ferric saccharate <p>Water insoluble, poorly soluble in dilute acid</p> <ul style="list-style-type: none"> Ferric orthophosphate Ferric pyrophosphate Elemental iron <ul style="list-style-type: none"> H-reduced Atomized CO-reduced Electrolytic Carbonyl Encapsulated forms <ul style="list-style-type: none"> Ferrous sulfate Ferrous fumarate
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Zinc	Zinc acetate Zinc chloride Zinc citrate Zinc gluconate Zinc lactate Zinc oxide Zinc carbonate Zinc sulphate Zinc bisglycinate
Vitamin A	Retinol Retinyl acetate Retinyl palmitate Beta-carotene
Thiamin (Vitamin B ₁)	Thiamin hydrochloride Thiamin mononitrate
Riboflavin (Vitamin B ₂)	Riboflavin Riboflavin 5'- phosphate sodium
Niacin (Vitamin B ₃)	Nicotinic acid Nicotinic acid amide (nicotinamide)
Pyridoxine (Vitamin B ₆)	Pyridoxine hydrochloride Pyridoxal 5- phosphate Pyridoxine dipalmitate
Folic acid (Vitamin B ₉)	Folic acid (N-pteroylmonoglutamic acid) Calcium-L-methyl-folate
Vitamin B ₁₂	Cyanocobalamin Hydroxocobalamin
Vitamin D	Ergocalciferol Cholecalciferol

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SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI which includes surveillance inspection of the factory, testing of both factory and market samples.

Further particulars of the terms and conditions of the permit may be obtained from the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.



SRI LANKA STANDARDS INSTITUTION

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