SRI LANKA STANDARD 928: 2022
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SPECIFICATION FOR KURAKKAN FLOUR (*First Revision*)

SRI LANKA STANDARDS INSTITUTION

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SLS 928: 2022

Gr. 8

SRI LANKA STANDARDS INSTITUTION
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Sri Lanka

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This Standard does not purport to include all the necessary provisions of a contract

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SPECIFICATION FOR KURAKKAN FLOUR
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FOREWORD

This Standard was approved by the Sectoral Committee on Food Products and authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2022-07-07

This Standard was first published in 1991. In this first revision, limits for potentially toxic elements, iron dust, pesticide residues and mycotoxins have been introduced.

This Standards is subject to the provisions of the Food Act No. 26 of 1980 and the regulations framed thereunder.

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 an analysis shall be rounded off in accordance with **SLS 102**. The number of significant places to be retained in the rounded off value shall be the same as that of the specified value in this Standard.

In the preparation of this Code the assistance derived from the following publication is gratefully acknowledged.

EAS 89: 2011 Millet flour – Specification

1 SCOPE

This Standard prescribes the requirements and methods of sampling and test for kurakkan flour.

2 REFERENCES

SLS 102 Presentation of numerical values
SLS 124 Test sieves
SLS 143 General principles of food hygiene
SLS 428 Random sampling methods
SLS 516 Methods of test for microbiology of food and animal feeding stuffs
Part 2 Horizontal for the enumeration of yeasts and moulds.
Section 2: Colony count technique in products with water activity less than or equal to 0.95
SLS 586 Methods of test for sugar confectionery
SLS 910 Limits for pesticide residues in food
SLS 962 Foodstuffs – Determination of aflatoxin B_1, and the total content of aflatoxins B_1, B_2, G_1 and G_2 in cereals, nuts and derived products – High-performance liquid chromatographic method
SLS 1549 Methods of test for cereals, pulses and derived products
Part 1: pulses- determination of moisture content-air-oven method

Part 2: Determination of the nitrogen content and calculation of the crude protein content- kjeldhal method
Part 4: Determination of ash yield by incineration
Official Methods of Analysis of the Association of official Analytical Chemists (AOAC), 20th Edition 2016

3 DEFINITIONS

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

3.1 kurakkan flour: Product obtained from kurakkan grain *(Eleusine coracana* Gaertn.) after the process of cleaning, grinding and sieving

3.2 extraneous matter and foreign matter: Extraneous matter includes husk, plant materials other than kurakkan grain. Foreign matter includes other grains, sand, metal pieces, and insect and rodent contaminants

4 RAW MATERIAL

kurakkan grains,

5 REQUIREMENTS

5.1 Hygiene

Kurakkan flour shall be processed, packaged, stored and distributed under hygienic conditions as prescribed in **SLS 143**.

5.2 Appearance

The product shall be in the form of fine particles and characteristic colour.

5.3 Odour

Kurakkan flour shall be free from objectionable odour.

5.4 Foreign matter and extraneous matter

The product shall be free from foreign matter, extraneous matter and evidence of fungal or other infestation.

5.5 Adulterants

No substances shall be added to kurakkan flour. The kurakkan flour shall be free from adulterants when examined through the microscope

5.6 Microscopic appearance

The product shall have the characteristic shape of kurakkan starch granules as illustrated in Figure **1**, when examined in accordance with the method given in Appendix **C**.

5.7 Particle size

5.7.1 *Fine flour*

The particle size of the product shall be ground such that the material retained on a sieve with the aperture size of 300 µm is not more than 3.0 per cent by mass, when tested in accordance with the method given in Appendix **B**.

5.7.2 *Coarse flour*

The particle size of the product shall be ground such that the material retained on a sieve with the aperture size of 300 µm is not less than 3.0 per cent by mass and not more than 30.0 per cent by mass, when tested in accordance with the method given in Appendix **B**.

5.8 Other requirements

The product shall comply with the requirements given in Table **1** when tested in accordance with the methods given in Column **4** of the table.

TABLE 1 - Requirements for kurakkan flour

SlNo (1)	**Characteristic** (2)	**Requirement** (3)	**Method of test** (4)
i)	Moisture, per cent by mass, max.	13.0	**SLS 1549 Part 1**
ii)	Starch, on dry basis, per cent by mass, min.	75.0	Appendix **D**
iii)	Total ash, per cent by mass, max.	2.5	**SLS 1549 Part 4**
iv)	Acid insoluble ash, per cent by mass, max.	0.1	Appendix **E**
v)	Protein content (N × 5.7), on dry basis, per cent by mass, min.	6	**SLS 1549 Part 2**

5.9 Microbiological limits

The product shall conform to the limits given in Table **2** when tested in accordance with the method given in Column **4** of the table.

TABLE 2 - Microbiological limits

Sl No (1)	Test Organism (2)	Limit (3)	Method of test (4)
i)	Moulds, per g, max.	1×10^4	**SLS 516 Part 2 Section 2**
ii)	E.coli, MPN per g	absent	**SLS 516 Part 12**

6 CONTAMINANTS

6.1 Iron dust

Iron dust shall not exceed 3.0 mg/ kg when tested in accordance with test method given in Appendix **F**.

6.2 Potentially toxic elements

The product shall not exceed the limits for potentially toxic element given in Table **3**, when tested according to the methods given in Column **4** of the table.

TABLE 3 - Limits for potentially toxic element

Sl No (1)	Potentially toxic element (2)	Limit (3)	Method of test (4)
i)	Arsenic as As, mg/ kg, max.	0.1	**AOAC 986.15/ AOAC 2013.06**
ii)	Lead as Pb, mg/ kg, max.	0.2	**AOAC 994.02/ AOAC 2013.06**
iii)	Cadmium as Cd, mg/ kg, max.	0.1	**AOAC 999.11/ AOAC 2013.06**

6.3 Mycotoxin

The product shall not exceed the limits for mycotoxins given in Table **4**, when tested according to the methods given in Column **4** of the table.

TABLE 4 - Limits for mycotoxins

Sl No (1)	Mycotoxin (2)	Limit (3)	Method of test (4)
i)	Total aflatoxins, µg/ kg, max.	4.0	**SLS 962 Part 1** or **AOAC 968.22**
ii)	Aflatoxins B_1, µg/ kg, max.	2.0	**SLS 962 Part 1** or **AOAC 968.22**

6.4 Pesticide residues

Kurakkan flour shall be processed with special care under Good Agricultural Practices and Good Manufacturing Practice (**SLS 143)**, so that residues of those pesticides which may be required in the cultivation and production do not remain or if practically unavoidable, are reduced to the maximum extent possible. The product shall comply with the maximum pesticide residue limits given in **SLS 910**.

NOTE
It is not necessary to carry out this determination as a routine for all the samples. This should be tested in case of dispute and when required by the purchaser or vendor or when there is any suspicion of pesticide contamination.

7 PACKAGING

The product shall be hygienically packaged in moisture proof food grade material and sealed to protect the contents from contamination and deterioration during storage and transport.

8 MARKING AND/ OR LABELING

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

a) Name of the product as "kurakkan flour";
b) According to the particle size, the word “fine” or “coarse”, as the case may be, shall be included in conjunction with or in close proximity to the product name;
c) Brand name or trade name, if any;
d) Date of manufacture;
e) Date of expiry;
f) Net mass, in “g” or “kg”;
g) Name and address of manufacturer or distributer; and
h) The batch or code number or a decipherable code marking.

9 METHODS OF TEST

Tests shall be carried out as prescribed in the Appendix **B** to **F** this Standard**, Section 2/ Part 2** of **SLS 516, Part 1** of **SLS 962**, **Part 1, Part 2** and **4** of **SLS 1549,** and Official Methods of Analysis of the Association of Official Analytical Chemists (**AOAC**), 20th Edition, 2016.

10 CRITERIA FOR CONFORMITY

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

10.1 Each container examined as in clause **A.6.1** satisfies the packaging, marking and/ or labeling requirements**.**

10.2 Each container examined as in clause **A.6.2** satisfies the requirements given in **5.2, 5.3** and **5.4**.

10.3 Each container examined as in clause **A.6.3** satisfies the requirement for moisture given in **5.7** Sl No (i) of Table **1**.

10.4 Each container examined as in clause **A.6.4** satisfies the requirements given in **5.5, 5.6, 5.7** and **6**.

10.5 Each container examined as in clause **A.6.5** satisfies the requirement given in **5.8**.

APPENDIX A
SAMPLING

A.1 LOT

In any consignment all packages of kurakkan flour of the same size and particle size belonging to one batch of manufacture or supply shall constitute a lot.

A.2 GENERAL REQUIREMENTS OF SAMPLING

In drawing, preparing, storing and handling samples, following precautions and directions shall be taken.

A.2.1 Samples shall be drawn in a protected place not exposed to damp, air, dust or soot.

A.2.2 The sampling instruments shall be clean and dry when used. When drawing samples for microbiological examination, the sampling instruments shall be sterilized.

A.2.3 Precautions shall be taken to protect the samples, the product being sampled and the sample container from adventitious contamination.

A.2.4 The samples shall be placed in clean and dry containers. The size of the sample containers shall be of such size that they are almost completely filled by the sample. When drawing samples for microbiological examination, the sample containers shall be sterilized.

A.2.5 The sample containers shall be sealed, air-tight after filling and marked with necessary details of sampling.

A.2.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the room temperature.

A.3 SCALE OF SAMPLING

A.3.1 Samples shall be tested from each lot for ascertaining its conformity to the requirements of this Standard.

A.3.2 The number of packages to be selected from a lot shall be in accordance with table **5**.

Table 5 – Scale of sampling

Name of packages in the lot (1)	Number of packages to be selected (2)
Up to 500	5
501 to 1 200	5
1 201 to 3 000	6
3 201 to 10 000	7
10 001 and above	8

A.3.3 The packages shall be selected at random. In order to ensure randomness of selection tables of random numbers as given in **SLS 428** shall be used.

A.4 PREPARATION OF THE SAMPLE FOR MICROBIOLOGICAL TESTING

A sub sample of five (05) packages shall be selected from the packages selected in **A.3.2**. Approximately equally sufficient quantities of material shall be drawn from each package using an appropriate sampling instrument and transferred to five sterile containers.

A.5 PREPARATION OF THE COMPOSITE SAMPLE

Approximately equal quantities shall be drawn from each package selected as in **A.3.2** using an appropriate sampling instrument, mixed and reduced by the coning and quartering method to get a composite sample of sufficient size and transferred to a moisture proof sample container.

A.6 NUMBER OF TESTS

A.6.1 Each package selected as in **A.3.2** shall be inspected for packaging and marking and/or labeling requirements.

A.6.2 Each package selected as in **A.3.2** shall be inspected for **5.2, 5.3, 5.4** and **5.5**.

A.6.3 Each package selected as **A.3.2** shall be tested individually for moisture content given in **5.7** Sl No (i).

A.6.4 The composite sample prepared as in **A.5** shall be tested for the requirements given in **5.6, 5.7, 5.8** (except moisture), and **6**.

A.6.5 The five samples prepared as in **A.4** shall be tested individually for microbiological requirements given in **5.9**.

APPENDIX B
DETERMINATIONS OF PARTICLE SIZE

B.1 APPARATUS

B.1.1 S*ieve*, 300 μm conforming to **SLS 124**

B.1.2 *Balance*, having a sensitivity of 0.01 g

Weigh, to the nearest 0.1 g, about 100 g of sample into the Sieve. Sieve for a minimum period of 5 minutes with occasional tapping on the sieve until all the sievable particles are passed through the sieve. Transfer the material retained on the sieve quantitatively in to a tared dish and weigh.

B.3 CALCULATION

Material retained on the sieve, per cent by mass = $\frac{m_2}{m_1} \times 100$

where,

m_1 is the mass, in g, of the test portion; and
m_2 is the mass, in g, of the material retained on the sieve.

APPENDIX C
MICROSCOPIOCAL EXAMINATION

C.1 APPARATUS

C.1.1 *Microscope, with a magnification of* × 600

C.1.2 *Microscope slides*

C.1.3 *Cover slips*

C.1.4 *Test tubes*

C.1.5 *Glass rod*

C.2 PROCEDURE

Weigh about 1 g of sample, place it in a test tube, add distilled water to wet the flour, crush and add 50 ml of distilled water and mix. Shake the test tube thoroughly and take 1 or 2 drops of the suspension on a slide, by means of a glass rod (*see Note* 1). Place a cover slip on the glass slide so that no air bubble is present between the cover slip and the slide (*see Note* 2).

NOTES

1 *The quantity of material taken should be such that while the field of view under the microscope shows numerous granules, they* are *not so crowded* as to *overlap.*

2 *When placing the cover slip in position, care should be taken not to exert excessive pressure in order to avoid breaking of clusters.*

Examine, at least 5 slides prepared as above, under a microscope and compare the outline of the starch granules with that in the photomicrograph given in Figure **1**.

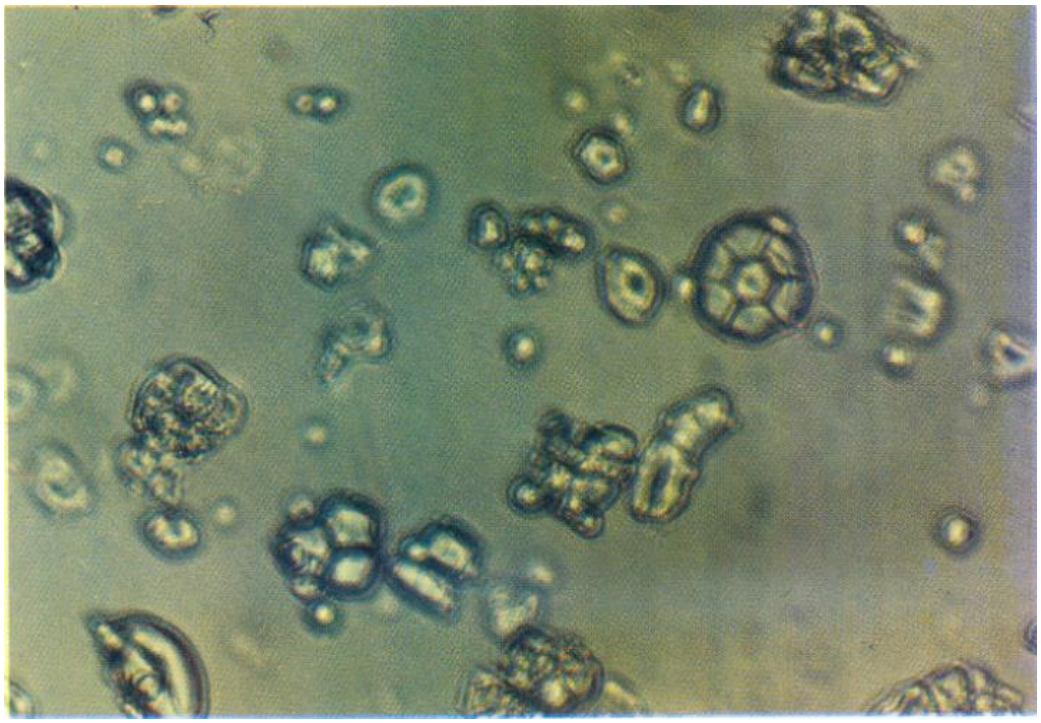

FIGURE **1**: Photomicrograph of kurakkan starch granules ×660

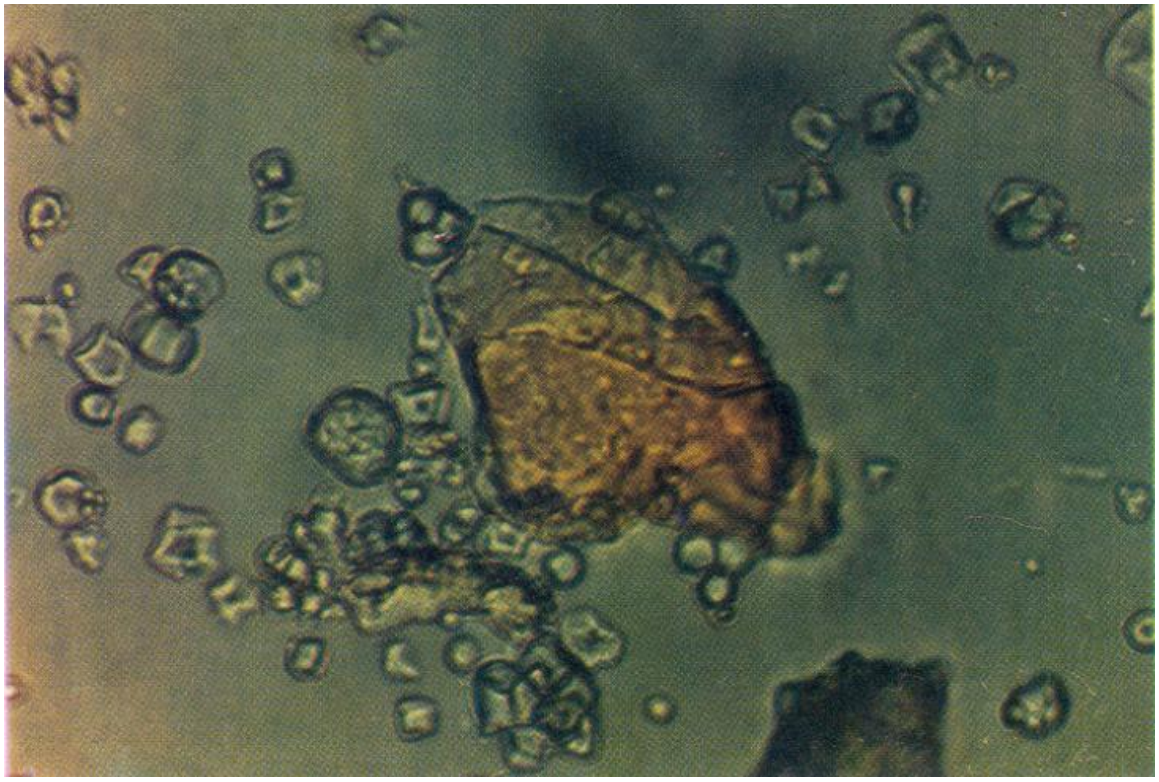

FIGURE **2**: Photomicrograph of Kurakkan starch granules and parts of the seed-coat of the grains x 660

Kurakkan starch generally consists of both small and large compound grains. The size of kurakkan starch granules range from 6 μm to 20 μm. The granules are polygonal in shape.

The kurakkan flour which is commercially available has a fair portion of the seed-coats of the grain. Therefore, the main characteristics are as follows;

a) Single polygonal grains with a visible central phylum. Sometimes faintly fissured;

b) Compound polygonal grains;

c) Fragments of the above varying shapes; and

d) Parts of the seed-coat.

APPENDIX D
DETERMINATION OF STARCH

D.l REAGENTS

D.1.1 *Di-ethyl ether*

D.l.2 *Ethyl alcohol*, 10 per cent (V/V)

D.l.3 *Hydrochloric aaid*,10 per cent (V/V)

D.l.4 *Sodium carbonate solution*, 20 per cent (m/v)

D.2 PREPARATION OF SAMPLE SOLUTION

Weigh, to the nearest milligram, about 2 g of the sample. Place on a Whatman No. 1 filter paper or equivalent and extract with five 10 ml portions of diethyl ether (**D.1.1**). Evaporate the ether from the residue and wash with 150 ml ethy1 alcohol (**D.1.2**). Carefully wash off the residue from the filter paper with 200 ml of cold water. Reflux the residue with 200 ml of hydrochloric acid **(D.1.3**) in a flask with reflux condenser for 2 ½ hours. Cool and neutralize with sodium carbonate solution (**D.1.4**) and transfer quantitatively to a 500-ml graduated flask and make up to volume.

Then proceed as given in Clause 6 of **SLS 586:1982**.

D.3 CALCULATION

$$\text{Starch (on dry basis), per cent by mass} = \frac{9.3\,mV}{m_1(100 - M)}$$

Starch (on dry basis), per cent by mass

where,

m is the milligrams of anhydrous dextrose in one millilitre of the prepared solution of the material;
V is the total volume in ml of the prepared solution;
m_1 is the mass in g of the material used to prepare V ml of the solution; and
M is the percentage of moisture.

APPENDIX E
DETERMINATION OF ACID INSOLUBLE ASH

Follow the method given in **SLS 1549 Part 4** to obtain total ash and proceed determination of acid in soluble ash content as follows:

E.l APPARATUS

E.1.1 *Muffle furnace*, maintained at 550 °C ± 25 °C

E.2 REAGENTS

E.2.1 *Dilute hydrochloric acid,* approximately 5 mol/1

E.3 PROCEDURE

To the ash contained in a dish (as given in **9.5** of **SLS 1549 Part 4: 2016**), add 25 ml of dilute hydrochloric acid (**E.2.1**), cover with a watch-glass and heat on a water-bath for 10 minutes. Allow to cool and filter the contents through a ashless filter paper (Whatman No. 42 or its equivalent). Wash the filter paper with water until the washings are free from acid. Return the filter paper and the residue to the dish. Ignite the filter paper and the residue in the dish with the flame till it chars. Ignite in the muffle furnace at 550 °C ± 25 °C for one hour. Cool the dish in a desiccator and weigh.

Repeat the process of heating for 30 minutes, cooling and weighing till the difference in mass between two successive weighings is less than one milligram. Note the lowest mass.

E.4 CALCULATION

$$\text{Acid insoluble ash (on dry basis), per cent by mass} = \frac{m_2 - m_0}{m_1 - m_0} \times 100$$

where,

m_0 is the mas, in g, of the empty dish;
m_1 is the mass, in g, of the dish with the dried material taken for the determination of total ash; and
m_2 is the mass, in g, of the dish with the acid insoluble ash.

APPENDIX F
DETERMINATION OF IRON DUST

F.1 REAGENTS

F.1.1 *O-Phenanthroline solution* - dissolve 0.1 g of O-phenanthroline in about 80 ml H_2O at 80 °C, cool and dilute to 100 ml.

F.1.2 *α, α - dipyridyl solution* - dissolve 0.1 g of α,α - Dipyridyl in H_2O and dilute to 100 ml.

NOTE
Reagents **F.1.1** *and* **F.1.2** *kept in cool, dark place will remain stable several weeks*

F.1.3 Iron standard solution - 0.01 mg Fe/ ml Dissolve 0.1 g analytical grade Fe wire in 20 ml HCl and 50 ml H_2O, and dilute to 1000 ml. Dilute 100 ml of this solution to 1000 ml or dissolve 3.512 g $Fe(NH_4)_2 (SO_4)_2 . 6H_2O$ in H_2O, add 2 drops HCl, and dilute to 500 ml. Dilute 10 ml of this solution to 1000 ml.

F.1.4 Acetate buffer solution - dissolve 8.3 g anhydrous $NaC_2H_3O_2$ (Previously dried at 100 °C) in H_2O, add 12 ml acetic acid, and dilute to 100 ml. (It may be necessary to redistill acetic acid and recrystallize $NaC_2H_3O_2$ from H_2O, depending on amount of Fe present)

F.2 APPARATUS

Spectrophotometer

F.3 PROCEDURE

F.3.1 Preparation of standard curve

Construct a 10-point standard curve, plus zero, preparing solutions containing 0.0 (Zero), 2.0, 5.0, 10.0, 15,0, 20.0, 25.0, 30.0, 35.0, 40.0 and 45.0 ml) respectively, of final diluted Fe standard solution **(F.1.3),** plus 2.0 ml HCl in 100 ml H_2O

Alternatively, construct a 5-point curve (5.0, 15.0, 25.0, 35.0 and 45.0 ml), plus zero, after correction for reagent blank.

Using 10 ml of each these solutions proceed as in **F.3.2** beginning add 1 ml $H_2NOH.HCl$ plot concentration against scale reading.

F.3.2 Determination by dry ashing

Ash 5.00 g of flour in Pt, SiO, or porcelain dish about 60-mm diameter, 35-ml capacity as in Appendix C (Porcelain evaporating dishes of about 25-ml capacity are satisfactory. Do not use flat-bottom dishes of diameter > 60 mm). Cool and weigh. If per cent ash is desired, continue ashing until practically C-free. To diminishing time, or for samples that do not burn practically Carbon free, use one of following ash aids.

Moisten ash with 0.5 - 1.0ml Mg $(NO_3)_2$ solution or with redistilled HNO_3. Dry and carefully ignite in furnace, avoiding spattering, (white ash with no C results in most cases) Do not add these ash aids to self-rising flour (products containing NaCl) in Pt dish because of vigorous action on dish cool, add 5 ml HC1, letting acid rinse upper portion of dish, and evaporate to dryness on steam bath. Dissolve residue by adding 2.0 ml HC1, accurately measured, and heat 5 min on steam bath with watch glass on dish. Rinse watch glass and dilute residue solution to 100 ml with H_2O. If necessary (undissolved particles visible in residue solution), filter diluted residue solution through ashless paper and discard first 15-20 ml filtrate.

Pipette 10 ml aliquot into 25 ml volumetric flask and add 1 ml H_2NOH.. HC1 solution; let stand 5 min and then add 5 ml buffer solution, **F.1.4** and 1 ml O-Phenanthroline, **F.1.1** or 2 ml dipyridyl solution, **F.1.2** and dilute to volume. Determine absorbance A, in spectrophotometer to photometer at about 510 nm. From reading, determine Fe concentration form equatic line

representing standard points or by reference to standard curve for known Fe concentration. If further dilution is required to maintain sample absorbance reading below highest standard point on curve, pipette smaller aliquot into 25.0 ml flask, dilute to 10.0 ml with 2 % HC1 solution and continue as described in **F.3.2** paragraph 3 Determine blank on reagents and make correction.

Calculate Fe in flours as mg/ kg.

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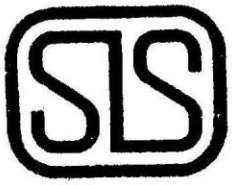

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SRI LANKA STANDARDS INSTITUTION

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