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Draft Sri Lanka Standard
SPECIFICATION FOR SPECIALTY FERTILIZER
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SPECIFICATION FOR SPECIALITY FERTILIZERS

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Draft Sri Lanka Standard
SPECIFICATION FOR SPECIALTY FERTILIZERS

FOREWORD

This Sri Lanka 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.....

Specialty fertilizers are liquid or solid that are applied to the soil and/or foliage. Specialty fertilizers provide nutrient to the crops. Specialty fertilizers consist of primary nutrient and may contain beneficial microorganisms and/or micronutrients.

This Standard is subjected to the restrictions imposed under the Regulation of Fertilizer Act No. 68 of 1988, Fauna and Flora Protection Act No. 44 of 1964 Plant Protection Act No 35 of 1999, Food Act No. 26 of 1980, Animal Diseases Act, No. 59 of 1992, National Environmental Act No. 47 of 1980 and quarantine and prevention of diseases ordinance (chapter 222), their amendments and the regulations framed thereunder, and any other regulatory and statutory requirements wherever applicable.

Guidelines for the determination of compliance of a lot to 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 results of a test shall be rounded off in accordance with **SLS 102**. The number of significant figures 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 Standard, the valuable assistance derived from the publications of European Council is gratefully acknowledged.

1 SCOPE

The Standard specifies the requirements and methods of sampling and test for Specialty fertilizers of solid and liquid forms of organic, inorganic and combination types.

2 REFERENCES

| | |
|---------|--|
| SLS 83 | SI units and recommendations for use of their multiples and of certain other units |
| SLS 102 | Rules for rounding off numerical values |
| SLS 428 | Random sampling methods |
| SLS 645 | Methods of test for fertilizers |
| | Part 1: Determination of Nitrogen content |
| | Part 4: Determination of Potassium content |

| | |
|--|---|
| SLS 516 | Part 5: Determination of Phosphorous content Methods of test for microbiology of food and animal feeding stuffs Part 5: Horizontal method for the detection of <i>Salmonella spp</i> Part 12: Method of detection of <i>E.coli</i> . |
| SLS 1324 | Requirements for organic agriculture production and processing |
| SLS 1526 | Method of test for determination of soil pH |
| SLS ISO 11265 | Method of test for determination of soil specific electrical conductivity |
| SLS 12005 | Nanotechnologies – characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing |
| SLS 12006 | Nanotechnologies – material specifications guidance on specifying nano – objects |
| SLS 12007 | Nanotechnologies – occupational risk management applied to engineered nanomaterials |
| SLS 12008 | Nano materials- preparation of material safety data sheet (MSDS) |
| SLS 12009 | Nanotechnologies – guidance on physico-chemical characterization of engineered nano scale materials for toxicology assessment |
| DSLS ISO 14820 | Fertilizers and liming materials — Sampling and sample preparation |
| Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC), 20 th Edition, 2016 | |

3 DEFINITIONS

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

3.1 Batch: Specialty fertilizers that are produced from the same type of materials, at the same time and location, by the same manufacturer/ producer, or made during the same cycle or period of manufacture

3.2 Combined specialty fertilizer: Specialty fertilizer containing both inorganic and organic components

3.3 Composite nanomaterials: The materials that contain mixture of several different categories of materials. They include all types of materials mentioned in the material categories list

3.4 Fertilizer: Substance containing one or more recognized plant nutrient(s), which is used for its plant nutrient content and which is designed for use or claimed to have value in promoting plant growth

3.5 Fertilizer nutrient: Plant nutrient applied in the course of fertilization

3.6 Inorganic fertilizer: Fertilizer without organic material other than those defined as additives

3.7 Inorganic nanomaterials: Owing to their high stability, simple synthesis methods using bottom-up approaches, and a wide range of tunable physicochemical properties such as shape, size, surface charge, surface area, crystallinity and composition, are a versatile choice for agri-inputs compared to organic nanomaterials. The properties such as optical

(absorption and fluorescence), electrical (conductivity and surface charge), magnetic and thermal can be easily tailored for a specific application requirements

3.8 Nanoparticle: Small particle that ranges between 1 to 100 nanometers in size

3.9 Nano-agriproducts: Agricultural input preparation containing nanomaterials intended for external and internal applications (through soil, seed, foliar, and drip in crops as well as by other means) on crop for the purpose of agricultural farming.

NOTE: *The suspension should be solubilized after further dilution*

3.10 Naturally occurring minerals: Materials that are directly mined from mineral deposits and only subjected to physical processes including crushing, drying and sieving.

3.11 Organic fertilizer: Material containing carbon or one or more elements other than hydrogen and oxygen, mainly of plant and/ or animal origin added either directly to the plant or to the soil, specially, for the nutrition of plant and that may improve soil structure

3.12 Organic nanomaterials: Organic compounds such as lipids, proteins and carbohydrates. They are primarily used in agriculture due to their low toxicity. Examples of organic nanomaterials used in agriculture include synthetic nano-biochar, liposome, albumin n, polymer-protein or polymer conjugates. The precursor materials used for synthesis of organic materials are generally considered to be non-toxic and biodegradable.

3.13 Plant macro nutrient: Group of nutrients needed by plants in large amounts (plant contains greater than 1g / per kg in plants).

3.14 Plant micro nutrient: Group of nutrients which are essential for plant growth but are required in small amounts (plant contains less than 1 g / kg in plant).

3.15 Plant nutrient: Chemical element, which is essential for plant growth

3.16 Primary nutrient: Elements nitrogen, phosphorus and potassium only.

3.17 Primary nutrient elements: Nitrogen, phosphorus, and potassium only

3.18 Solid form: Form characterized by structural rigidity and resistance to changes of shape or volume and in which the atoms are tightly bound to each other, either in a regular geometric lattice (crystalline solids) or in an irregular manner (an amorphous solid)

3.19 Specialty fertilizer: The materials that are used for the Agriculture with special properties and special functions than normal fertilizer.

4. Types and forms

4.1 Types

- a Inorganic specialty fertilizer
- b Organic specialty fertilizer
- c Combined specialty fertilizer

4.2 Forms

- a Liquid form
- b Solid form

5 REQUIREMENTS

5.1 General requirements

5.1.1 The manufacturer / processor shall declare the product; whether it is containing nano materials or not.

5.1.2 Special identified property/ properties shall be scientifically proven with acceptable experimental methods/ procedures.

5.1.3 The product shall be biocompatible.

5.1.4 The product shall not exceed the maximum permissible levels of substances that are likely to be harmful or injurious to vegetation, animals, soil health, public health or the environment when used according to its intend use specified by the label.

5.1.5 For nano-fertilizer, the product shall comply with the product safety guidelines on health and safety practices prescribed in SLS 12005, 12006, 12007, 12008 and 12009

5.2 Chemical and physical requirements

The product shall conform to the requirements given in Table 1 to 5, when tested according to the methods given in Column 4 of the Table 1, 2, 3, 4 and 5.

TABLE 1 – Chemical and physical requirements for Inorganic specialty fertilizers of liquid form

| SI No. (1) | Characteristic (2) | Requirement (3) | Method of test (4) |
|---------------|--|--------------------|---|
| i) | pH* | 6.0-8.5 | SLS 1526 |
| ii) | Electrical conductivity, dS/m, max. | 20 | SLS ISO 11265 |
| iii) | Total Nitrogen content as N, per cent by mass, min. | 1.5 | SLS 645: Part 1 |
| iv) | Total Potassium content as K ₂ O, per cent by mass, min. | 1.5 | SLS 645: Part 4 |
| v) | Total Phosphorus content as P ₂ O ₅ , per cent by mass, min. | 1.5 | SLS 645: Part 5 |
| vi) | Total primary nutrient, (N+ P ₂ O ₅ + K ₂ O) per cent by mass, min. | 5.0 | SLS 645: Part 1, SLS 645: Part 4, SLS 645: Part 5 |

Note; Where. Inorganic specialty fertilizers of liquid form, contains only one plant macro nutrient the minimum content of declared nutrient shall not be less than 5 per cent by mass

TABLE 2 – Chemical and physical requirements for Organic specialty fertilizers of liquid form

| SI No. (1) | Characteristic (2) | Requirement (3) | Method of test (4) |
|---------------|---|--------------------|--|
| i) | pH | 6.0-8.5 | SLS 1526 |
| ii) | Electrical conductivity, dS/m, max. | 10 | SLS ISO 11265 |
| iii) | Total Nitrogen content as N, per cent by mass, min. | 2 | SLS 645: Part 1 |
| iv) | Total Potassium content as K ₂ O, per cent by mass, min. | 1 | SLS 645: Part 4 |
| v) | Total Phosphorus content as P ₂ O ₅ , per cent by mass, min. | 1 | SLS 645: Part 5 |
| vi) | Total primary nutrient, (N+ P ₂ O ₅ + K ₂ O) per cent by mass, min | 3 | SLS 645: Part 1, SLS 645: Part 4, SLS 645: Part 5 |
| vii) | Organic carbon per cent by mass, min. | 5.0 | Appendix B |

Note; Where organic specialty fertilizers of liquid form, contains only one plant macro nutrient the minimum content of declared nutrient shall not be less than 3 per cent by mass

TABLE 3 – Chemical and physical requirements for Combined specialty fertilizer of liquid form

| SI No. (1) | Characteristic (2) | Requirement (3) | Method of test (4) |
|---------------|---|--------------------|--|
| i) | pH | 6.0-8.5 | SLS 1526 |
| ii) | Electrical conductivity, dS/m, max. | 10 | SLS ISO 11265 |
| iii) | Total Nitrogen content as N, per cent by mass, min. | 2 | SLS 645: Part 1 |
| iv) | Total Potassium content as K ₂ O, per cent by mass, min. | 2 | SLS 645: Part 4 |
| v) | Total Phosphorus content as P ₂ O ₅ , per cent by mass, min. | 2 | SLS 645: Part 5 |
| vi) | Total primary nutrient, (N+ P ₂ O ₅ + K ₂ O) per cent by mass, min | 6 | SLS 645: Part 1, SLS 645: Part 4, SLS 645: Part 5 |
| vii) | Organic carbon per cent by mass, min. | 3.0 | Appendix B |

Where; One or more of the Inorganic fertilizers in the co-formulation of liquid form of Combined fertilizer shall not contain 16% or more by mass of nitrogen (N) as a result of ammonium nitrate (NH₄NO₃)

TABLE 4 – Chemical and physical requirements for Inorganic specialty fertilizers and Combined specialty fertilizer of solid form

| SI No. (1) | Characteristic (2) | Requirement (3) | Method of test (4) |
|---------------|---|--------------------|---|
| i) | pH | 6.0-8.5 | SLS 1526 |
| ii) | Electrical conductivity, dS/m, max. | 20 | SLS ISO 11265 |
| iii) | Total Nitrogen content as N, per cent by mass, min. | 5 | SLS 645: Part 1 |
| iv) | Total Potassium content as K ₂ O, per cent by mass, min. | 5 | SLS 645: Part 4 |
| v) | Total Phosphorus content as P ₂ O ₅ , per cent by mass, min. | 3 | SLS 645: Part 5 |
| vi) | Total primary nutrient, (N+ P ₂ O ₅ + K ₂ O) per cent by mass, min | 10 | SLS 645: Part 1, SLS 645: Part 4, SLS 645: Part 5 |
| vii) | Organic carbon per cent by mass, min.* | 5.0* | Appendix B |

Note; Where. Inorganic specialty fertilizers or combined specialty fertilizers of solid form, contains only one plant macro nutrient, the minimum content of declared nutrient shall not be less than 10 per cent by mass

* This requirement applied only for Combined Specialty Fertilizers

TABLE 5 – Chemical and physical requirements for organic specialty fertilizers of solid form

| SI No. (1) | Characteristic (2) | Requirement (3) | Method of test (4) |
|---------------|---|--------------------|---|
| i) | pH | 6.0-8.5 | SLS 1526 |
| ii) | Electrical conductivity, dS/m, max. | 20 | SLS ISO 11265 |
| iii) | Total Nitrogen content as N, per cent by mass, min. | 3 | SLS 645: Part 1 |
| iv) | Total Potassium content as K ₂ O, per cent by mass, min. | 1 | SLS 645: Part 4 |
| v) | Total Phosphorus content as P ₂ O ₅ , per cent by mass, min. | 1.5 | SLS 645: Part 5 |
| vi) | Total primary nutrient, (N+ P ₂ O ₅ + K ₂ O) per cent by mass, min | 5 | SLS 645: Part 1, SLS 645: Part 4, SLS 645: Part 5 |
| vi) | Organic carbon per cent by mass, min. | 15 | Appendix B |

Where; Organic specialty fertilizers of solid form, contains only one plant macro nutrient, the minimum content of declared nutrient shall not be less than 5 per cent by mass

5.3 Microbiological requirements

The product shall not exceed the microbiological limit given in Table 6 when tested according to the method prescribed in Column 4 of the Table 6.

TABLE 6 – Microbiological limits for all types and forms of specialty fertilizers

| SI No. (1) | Test organism (2) | Limit (3) | Method of test (4) |
|------------|------------------------------|-----------|-------------------------|
| i) | <i>E coli</i> MPN, per g | Absent | SLS 516: Part 12 |
| ii) | <i>Salmonella</i> , per 25 g | Absent | SLS 516: Part 5 |

5.4 Requirement for limits of potentially toxic elements

The product shall not exceed the limits for potentially toxic elements given in Table 7 and 8, when tested as prescribed in Column 4 of the Table 7 and 8.

TABLE 7 - Limits for potentially toxic elements for all the types of liquid forms of specialty fertilizers

| SI No. (1) | Elements (2) | Limit, mg/kg (maximum) (3) | Method of test (4) |
|------------|------------------|----------------------------|---------------------|
| i) | Arsenic, as As | 0.5 | AOAC 2006.03 |
| ii) | Cadmium, as Cd | 0.5 | |
| iii) | Chromium, as Cr | 0.5 | |
| iv) | Lead, as Pb | 1.0 | |
| v) | Mercury, as Hg** | 0.5 | |

***EPA 7473 can be used as alternative method for Hg determination.*

TABLE 8 - Limits for potentially toxic elements for all the types solid forms of specialty fertilizers

| SI No. (1) | Elements (2) | Limit, mg/kg (maximum) (3) | Method of test (4) |
|------------|------------------|----------------------------|---------------------|
| i) | Arsenic, as As | 3 | AOAC 2006.03 |
| ii) | Cadmium, as Cd | 1.5 | |
| iii) | Chromium, as Cr | 50 | |
| iv) | Lead, as Pb | 30 | |
| v) | Mercury, as Hg** | 0.5 | |

***EPA 7473 can be used as alternative method for Hg determination*

6 PACKAGING

The product shall be packaged in sound and strong compatible bags, bottles, containers or packages. Suitable packaging materials include plastic or glass or any other non-rusty materials. The product may also be supplied in bulk containers agreed upon between the purchaser and the vendor.

7 MARKING AND/ OR LABELLING

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

- a) Name of the product as "Specialty fertilizers";
- b) Name and address of the manufacturer, packer or distributor;
- c) Registered trade mark if any;
- d) Batch or code number;
- e) Net content in metric units;
- f) Date of manufacture;
- g) Date of expiry;
- j) Primary nutrient content;
- k) Crops for which it is intended;
- m) Dilution ratio/ Instructions for use; and
- n) Storage/disposal instructions;

8 SAMPLING

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

9 METHODS OF TEST

Tests shall be carried out as prescribed in Appendix B given in this Standard, SLS 1526, SLS ISO 11265, Part 1, Part 4 and Part 5 of SLS 645, Part 5 and Part 12 of SLS 516 and Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC).

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 inspected as in A.4.1 satisfies the packaging and marking and/or labelling requirements of this Standard.

10.2 The test results of the sample when tested as in A satisfy the requirements given in Clause 5.2, 5.3 and 5.4 of this Standard.

APPENDIX A COMPLIANCE OF A LOT

A.1 LOT

A.1.1 In a single consignment all the packages containing product belonging to the one batch of manufacture, or supply shall constitute a lot.

A.1.2 If the consignment is declared to consist of different batches of manufacture, containers of the same batch shall be grouped together and each group so formed shall constitute a separate lot.

A.2 SCALE OF SAMPLING

A.2.1 The sampling shall be carried out as prescribed in **DSLS ISO 14820**.

A.3 NUMBER OF TESTS

A.3.1 Each container selected as per as in **A.2.1** shall be inspected for packaging and marking and/or labelling requirements given in **Clauses 5 and 6** of this Standard.

A.3.2 Each container selected as in **A.2.1** shall be tested separately for the requirements given **5.2, 5.3 and 5.4** of this Standard.

APPENDIX B

DETERMINATIO OF ORGANIC CARBON (WALKLEY – BLACK METHOD)

B.1 APPARATUS

B.1.1 *Erlenmeyer flask*

B.2 REAGENTS

B.2.1 *Potassium dichromate solution* – Dissolve 49.04 g of potassium dichromate dried at 200°C for 2 hours.

B.2.2 *Sulfuric acid*- concentrated

B.2.3 *Phosphoric acid* (85 per cent)

B.2.4 *Diphenylamine indicator* – Dissolve 0.5 g diphenylamine in 20 ml of distilled water. Add 100 sulfuric acid and mix.