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SPECIFICATION FOR COMPOST MADE FROM RAW MATERIALS OF AGRICULTURAL ORIGIN

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard
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SLS 1635: 2019

Gr. 8

SRI LANKA STANDARDS INSTITUTION
17, Victoria Place
Elvitigala Mawatha
Colombo 8
Sri Lanka

Sri Lanka Standard

SPECIFICATION FOR COMPOST MADE FROM RAW MATERIALS OF AGRICULTURAL ORIGIN

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

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

Sri Lanka Standard
SPECIFICATION FOR COMPOST MADE FROM RAW MATERIALS OF AGRICULTURAL ORIGIN

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 2019-03-07.

This Standard prescribes the minimum requirements for compost made from raw materials of agricultural and animal origin. It does not include any type of hazardous waste.

For the purpose of deciding whether a particular requirement of this Specification 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 figures retained in the rounded off value shall be the same as that of the specified value in this Specification.

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**.

This Specification is subjected to the provisions of the National Environmental Act No. 47 of 1980 and regulation of fertilizer Act No 68 of 1988 , amendments and regulations framed thereunder.

In the preparation of this Standard, the assistance obtained from the following publications is gratefully acknowledged;
The Official Methods of Analysis, 17th Edition, Volume 1 (2000), Agricultural Chemicals, Contaminants.

1. SCOPE

This Standard prescribes the requirements and methods of sampling, testing and packaging for compost made from raw materials of agricultural and animal origin intended to use for crop production including food crop.

2. REFERENCES

SLS 102 Presentation of numerical values
SLS 428 Random sampling method
SLS 544 Code of practice for handling and storage of bagged fertilizers
SLS 559 Method for sampling fertilizers
SLS 645 Methods of test for fertilizers
Part 1: Determination of Nitrogen content
Part 2: Determination of moisture content
Part 4: Determination of Potassium content
Part 5: Determination of Phosphorus content
Part 6: Determination of Calcium and Magnesium content

SLS 1246 Specification for compost from municipal solid waste and agricultural waste
SLS 1526 Methods of test for Determination of soil pH

3. DEFINITIONS

3.1 raw materials of agricultural and animal origin: Materials resulting from the production and processing of crops and animals or agricultural products, including farm animal excreta, grasses, green manure and crop residues wherever produced

3.2 pathogens: Organisms causing diseases of man, animals or plants

3.3 plant macronutrient: Group of nutrients needed by plants in large quantities (greater than 1 mg/kg in plants).

3.4 plant micro nutrient: Group of nutrients which are essential for plant growth but are required in small quantities (less than 1 mg/kg in plants)

3.5 compost: Relatively stable decomposed / processed product resulting from decomposition with similar characteristics as humus, made from biodegradable constituents, which contain considerable amounts of plant nutrients. Composting is a bio degradation process brought by micro – organism and/or other biological agents

3.6 composting amendment : Any item added to the compost mixture to improve its quality

3.7 composting process: Process in which organic materials are biologically transformed into humus like stable organic substances through aerobic thermophilic decomposition under controlled conditions, which may include pasteurization and maturation phases

3.8 foreign matter: Any material not accepted presence in compost such as un-decomposed organic matters, metal, plastic, textile, polythene pieces etc.

3.9 friable: Easily crumble, pulverize or reduce to powder

4. REQUIREMENTS

4.1 General requirements

4.1.1 Colour

The colour of the material shall be brown, grey or dark black.

4.1.2 Keeping properties

The material shall comply with the requirements specified in this standard, after storage in packages/containers as prescribed in clause 6 at room temperature for not less than12 months from the date of production.

4.1.3 Moisture content

The material shall not contain more than 25 per cent of moisture by dry mass, when tested as prescribed in **SLS 645: Part 2.**

4.1.4 Odor

The material shall be free from any foul odor.

4.1.5 Texture

The texture of the material shall be friable when moist.

4.2 Physical Requirements

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

TABLE 1 - Physical Requirements

Sl No. (1)	Characteristics (2)	Requirement (3)	Method of test (4)
i)	pH	6.5 – 8.5	**SLS 1526**
ii)	Conductivity, dSm^{-1}, *max.*	4.0	Appendix **B**
iii)	Foreign matter.	Free from visible non-biodegradable materials except sand	Appendix **H**
iv)	Sand content percent by mass on dry basis, max.	20	Appendix **E**
v)	Particle size; residue particles when passing through 4 mm sieve, percent by mass, max.	2	Appendix **G**

4.3 Chemical Requirements

The product shall comply with the chemical requirements given in Table **2** when tested in accordance with the relevant methods given in Column **4** of the table.

TABLE 2- Chemical Requirements

Sl No. (1)	Characteristics (2)	Requirement (3)	Method of test (4)
i)	Total Nitrogen content as N, per cent by dry mass, min.	1.0	SLS 645: part 1
ii)	Total Phosphate content as P_2O_5, per cent by dry mass, min.	0.5	SLS 645: part 5
iii)	Total Potassium content as K_2O, as per cent, by dry mass, min.	1.0	SLS 645: part 4
iv)	Total Magnesium content, as MgO, per cent by dry mass, min.	0.5	SLS 645: part 6
v)	Total Calcium content, as CaO,per cent by dry mass, min.	0.7	SLS 645: part 6
vi)	Organic Carbon as C, per cent, by dry mass, min.	20	Appendix **C**
vii)	C:N ratio	10-25	Appendix **D**

4.4 Microbiological requirements

The material shall comply with the microbiological limits as prescribed in Table **3** when tested in accordance with the relevant methods given in Column **4** of the table.

TABLE 3 – Microbiological Requirements

SI. No. (1)	Characteristic (2)	Requirenment (3)	Method of test (4)
i)	Faecal coli forms colonies (MPN)/ g on dry weight basis.	Free	SLS 516 : Part 3
ii)	Salmonella per (MPN)/ 25 g on dry weight basis.	Free	SLS 516 : Part 5

4.4 Limits for potentially toxic elements

The product shall not exceed the limits for potentially toxic elements given in Table **4**.

TABLE 4 – Limits for potentially toxic elements

Sl. No. (1)	Potentially toxic element (2)	Requirements (3)	Method of test (4)
i)	Cadmium content, mg/kg dry mass, max.	3	
ii)	Chromium content, mg/kg dry mass, max.	50	2.6.35 AOAC
iii)	Lead content, mg/kg dry mass, max.	50	Method 2006
iv)	Mercury content, mg/kg dry mass, max.	0.5	
v)	Nickel content, mg/kg dry mass, max.	50	
vi)	Arsenic content, mg/kg dry mass, max.	3	

4.5 Biological Requirements

The material shall not contain more than 16 viable seeds per square meter when tested with methods prescribed in Appendix **F.**

5 PACKAGING

Compost shall be packed in sound and strong packages or containers. If polypropylene /woven or not, bags with an inner lining of low density polyethylene having a minimum thickness 50 µm or any other material with barrier properties superior (High Density Polyethylene) or equal to low density polyethylene of 50 µm thickness to afford maximum protection from normal hazard of transportation and handling. While those weighing 5 kg or less shall, be packed in polyethylene bag with a suitable thickness suitable packages include polypropylene, bags of mass 5-50 kg.

NOTE*: The material may also be supplied in bulk containers as agreed between the purchaser and the supplier.*

6 MARKING AND LABELLING

The bags shall legibly and indelibly marked with the following information and shall comply with Fertilizer Act and regulations in Sri Lanka.

The bags shall legibly and indelibly mark with the following information:

a. Name and type of the product;
b. Name and address of the manufacturer, including country of origin;
c. Brand name and/or trade mark, if any;
d. Date of manufacture;
e. Net mass in kilograms
f. Instructions for storage and use;
g. Date of Expiry;
h. Batch No;
J Total Nitrogen to total dry mass in percent by mass;
k Total Phosphorus (P_2O) to total dry mass; percent by mass

l Total Potassium (k_2O) to total dry mass percent by mass;
m Total Organic Carbon (C) to total dry mass percent by mass ;
n C:N ratio; and
o The statement “Use no hooks”.

7 HANDLING AND STORAGE

The handling and storage of the material shall be as prescribed in **SLS 544.**

8 SAMPLING

Representative samples of the product for ascertaining conformity to the requirements of their Specification shall be drawn as prescribed in Appendix **A**.

9 METHODS OF TEST

9.1 Test shall be carried out as prescribed in **SLS 1526,** Part **1**, **2, 4, 5** & **6** of **SLS 645**, Appendices **B, C, D, E, F, G, & H** of this Specification and **AOAC** Method **2.6.35, 2006.**

9.2 Unless otherwise stated, use only reagents of analytical grade and only distilled water or water of equivalent purity.

APPENDIX A
COMPLIANCE OF A LOT

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

A.1 LOT

In any consignment, all the packages of the same size containing fertilizer material of one batch of manufacture shall constitute a lot.

A.2 SAMPLING

The method of drawing representative samples of the material shall be as specified in the relevant clauses of **SLS 559**.

A.3 NUMBER OF TESTS

A.3.1 Each package selected in accordance with **SLS 559** shall be inspected for packaging and marking requirements given in Clause **5** and Clause **6.**

A.3.2 Tests for the requirements given in clause **4** shall be carried out on the composite sample prepared as in **SLS 559.**

A.4 CRITERIA FOR CONFORMITY

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

A.4.1 Each package inspected as in **A.3.1** satisfies the packaging and marking requirements.

A.4.2 Test results on the composite sample when tested as in **A.3.2** satisfies the relevant requirements.

APPENDIX B
DETERMINATION OF CONDUCTIVITY

B.1 REAGENTS

Potassium Chloride (AR grade), distilled water.

B.2 APPARATUS

Conductivity meter (with temperature compensation system), 4 mm sieve, flask (250 ml), beaker (100 ml), analytical balance, filter paper.

B.3 PROCEDURE

Sieve fresh sample of compost through a 4 mm sieve. Take 20 g of the sample and add 100 ml of distilled water. Stir for an hour at regular intervals. Calibrate the conductivity meter by using 0.01 M Potassium chloride solution. Measure the conductivity of the filtered compost suspension. Express the results as dsm^{-1} at $25^{o}C$.

APPENDIX C
DETERMINATION OF ORGANIC CARBON
(WALKLEY-BLACK METHOD)

C.1 APPARATUS

C.1.1 Erlenmeyer flask

C.2 REAGENTS

C.2.1 Potassium dichromate solution (Dissolve 49.04 g of potassium dichromate dried at 200 ^{o} C for 2 hours)

C.2.2 Concentrated. Sulfuric acid

C.2.3 Phosphoric acid (85 percent)

C.2.4 Diphenylamine indicator (Dissolve 0.5 g Diphenylamine in 20 ml of distilled water. Add 100 ml sulfuric acid and mix)

C.2.5 Ferrous sulfate solution (0.5 N)

Dissolve 140 g of Ferrous sulfate or 200 g of Ferrous ammonium sulfate in 15 ml concentrated Sulfuric acid and make up to 1000 ml with distilled water.

B.3 PROCEDURE

B.3.1 Weigh 0.025 g of the sample. Transfer to the Erlenmeyer flask using 10 ml of Potassium dichromate. Add 20 ml of Sulfuric acid. If the colour changes immediately to green, educe the sample. Leave for 30 minutes and dilute to 200 ml.

B.3.2 Add 10 ml of 85 per cent Phosphoric acid, then add 1.0 ml Diphenylamine indicator. Titrate against Ferrous sulfate solution till the colour changes to blakish green. Perform a blank titration.

B.4 CALCULATION

B.4.1 Normality of ferrous sulfate solution (N) $= \frac{10}{V_s}$

Organic carbon per cent by mass $= \frac{(V_b - V_s)\, N \times 0.399}{m}$

Where;

N is the normality of Ferrous sulfate solution;
V_s is the volume, in millitres of Ferrous sulfate used for the sample;
V_b is the volume, in millitres of ferrous sulfate used for the blank; and
m is the mass, in grams, of the sample used.

APPENDIX D
DETERMINATION OF CARBON TO NITROGEN RATIO

D.1 CALCULATION

$$\text{Carbon to Nitrogen ratio} = \frac{C}{N}$$

Where;

C is the organic Carbon content per cent by mass of the material; and
N is the Nitrogen content, per cent by mass of the material.

APPENDIX E
DETERMINATION OF SAND CONTENT

E.1 APPARATUS

E.1.1 Beaker, 500 ml
E.1.2 Oven, maintained at 105 $\pm$ 2 ^{0}C
E.1.3 Weighing balance, accuracy 1 mg

D.2 PROCEDURE

E.2.1 Weigh to the nearest milligram, 100 g of the sample. Transfer into a 500 ml beaker with a stopper. Add distilled water up to the mark and stir well by glass rod. Leave to settle.

E.2.2 Decant the water and the floating particles, leaving the sand at the bottom. Wash the residue thoroughly with water. Repeat washings until all the other particles are removed.

E.2.3 Transfer the sand into a Petri dish and dry in an oven maintained at 103 $\pm$ 2 ^{0}C for one hour. Cool in desiccators and weigh to the nearest milligram. Repeat the process of heating, cooling and weighing and 30 minute intervals until the difference between two consecutive readings does not exceed 0.002 g. Record the final mass.

E.3 CALCULATION

$$\text{Sand content per cent by mass} = \frac{m_1}{m_0}$$

Where;

m_0 is the mass, in grammes, of the sample; and
m_1 is the mass, in grammes, of sand.

APPENDIX F
DETERMINATION OF VIABLE WEED SEEDS

F.1 APARARUS

F.1.1 Propagation tray of dimension 20 cm x 20 cm x 5 cm

F.2 PROCEDURE

F.2.1 Take 1 of the sample and moisten with distilled water to an optimal content of 85 percent. Transfer the wet mixture into a propagation tray of dimension 20 cm x 20 cm x 5 cm. Cover the propagation tray with a transparent plastic cover with two ventilation openings.

F.2.2 Leave the propagation tray for four weeks at room temperature and the moisture content between 80 per cent to 90 per cent and optimal lighting shall be 12 hours of daylight per day. After two to four weeks count the seedlings.

F.3 CALCULATION

No. of viable weed seeds per square meter = n x 2.5

Where,

n is the number of seedlings counted (viable weed seeds).

APPENDIX G
METHOSD OF DETERMINATION OF PARTICLE SIZE GRADING

G.1 GENERAL

This Appendix sets out a method for determining the particle size grading of a product and the classification of the product based on this.

G.2 PRINCIPLE

Soil conditioners, coarse mulches and fine mulches are assessed using sieves of standard size apertures.

G. 3 APPARATUS

G.3.1 Stacking sieve with square apertures of 4 mm
G.3.2 A receiving fan for the sieves stack
G.3.3 Balance accurate to 0.01g
G.3.4 Means of measuring in millimeters

G . 4 PROCEDURE

G.4.1 Sieve and weigh particle size fractions

The Procedure shall be as follows:

a) Select a respective aliquot of a size determined as in the Appendix **A**, from the bag or batch of product being assessed. Air or oven dry at no higher than 40^0 C $+20^0$C

b) Determine mass of dry material sample to the nearest 1 g.

c) Place the entire dry material sample on a sieve stack comprising the 4 mm sieve on top then the receiving pan on the bottom.

d) Shake in a horizontal plane for 1 to 2 min until no more material falls through the 5 mm sieve.

e) Separately weigh material retained by 4 mm sieve the material to the nearest 1 g and record each of the weights.

G.5 CALCULATION

Each of the sieved fractions as a percentage (%) by weight of the total dry material samples

G.6 TEST REPORT

The test report shall be containing the following:

(a) Sample identification, including sufficient details to show the time ,manufacture and testing of the product; and

(b) The product classification by particle size grading and the proportion as a percentage of the total dry material sample shall be reported.

APPENDIX H
DETERMINATION OF VISIBLE CONTAMINANTS

H. 1 GENERAL

This Appendix sets out a method for determining the **v**isible contaminants with inorganic materials including stones, clay, glass, plastics, and metal etc.

H. 2 PRINCIPAL

The mass of a portion of the products is determined on an air dried aliquot of the sample.

H. 3 APPARATUS

H.3.1 Balance accurate to 0.01g

H.3.2 Weighing dishes (clean and dried) that are large enough to hold 200 ml or 500 ml

H.3.3 Tweezers

H.3.4 Sieve with 2 mm and 5 mm apertures

H. 4 PROCEDURE

(a) Take a representative sample of the product (as-received) of 200 g (w)
(b) Allow it to sun dry or oven dry
For products not derived from mixed solid waste, Screen the dried product sieve through a sieve with 2 mm apertures. For products derived from mixed solid waste, this step is omitted and visible contaminants are measured in the whole dried sample

(c) For products not derived from mixed solid waste, Screen the dried product sieve through a sieve with 2 mm apertures. For products derived from mixed solid waste, this step is omitted and visible contaminants are measured in the whole dried sample

(d) Remove by hand or tweezers from the >2 mm fraction all visible pieces of glass, hard Plastic, stones and metal. Determine their mass (m_1). Screen the >2 mm fraction through a sieve with 5 mm apertures. Discard the fine fraction. For products derived from mixed solid waste streams these contaminants are measured in the whole sample aliquot.

Percentage of visible contaminants $= \frac{m_1}{w} x100$

H. 6 TEST REPORT

The test report shall contain the following:

(a) Sample identification, including sufficient details to show the time elapsed between manufacture and testing of the product.

(b) Percentage, of moisture in the product to the nearest 1%.

Balls or clods of material may be broken up during sieving; this should be reported to the manufacturer and discouraged.

(c) Percentages of contaminants to two significant figures.
