Draft Tanzania Standard

Fertilizer- Potassium sulphate (sulphate of potash) - Specification

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(Draft for comments only)

0 FOREWORD

Potassium sulphate or sulphate of potash fertilizer is one of the important sources of potassium and sulphur nutrient elements to plants.

This Tanzania Standard is intended to guide manufacturers, importers, traders, farmers, regulatory authorities and other users to produce and select potassium sulphate sulphate of potash fertilizer of desirable quality.

In the preparation of this Tanzania Standard assistance was drawn from manufacturers' specifications

In reporting the results of a test or analysis made in accordance with this Tanzania Standard, if the final value observed or calculated, is to be rounded off, it shall be done in accordance with TZS 4

1 SCOPE

This Tanzania Standard prescribes the requirements and methods of sampling and test for potassium sulphate (sulphate of potash) fertilizer.

2 REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 4 *Rounding off numerical values.*

TZS 156 *Fertilizers and Soil Conditioners – Vocabulary*

TZS 159 *Fertilizers – Methods of sampling*

TZS 780 *Fertilizer – Code of practice for handling and storage.*

TZS 782 *Fertilizer – Methods for determination of heavy metal contaminants*

TZS 990 *Solid fertilizers – Determination of moisture content*

TZS 1014 *Solid fertilizers and soil conditioners – Test sieving*

TZS 1107 Solid fertilizers – Determination of mineral – acid- soluble sulphate content- Gravimetric method

3 TERMS AND DEFINITIONS

For the purpose of this standard, terms and definitions given in TZS 156 shall apply.

4 REQUIREMENTS

4.1 Physical

The material shall be crystalline, uniform colour and free from any foreign matter.

Not less than 90 per cent by weight of the material shall be of particles in the size range of 1 mm to 4 mm for prills or not less than 65% particles in the size range of 0.25mm to 1.7mm for powdered crystals. The fertilizer material shall be tested by TZS 1014.

4.2 Chemical

The potassium sulphate (sulphate of potash) fertilizer shall comply with the requirements given in Table 1.

Table 1 – Chemical requirements for potassium sulphate fertilizer

Characteristic	Requirement	Method of test
Potash contents (as K_2O) per cent by mass, minimum	50	Annex A
Total chloride (as Cl), per cent by mass, maximum	2.5	Annex C
Sodium content (as NaCl), per cent by mass, maximum	2.0	Annex B
Moisture per cent, by mass maximum	1.5	TZS 990
Sulphur (as S) per cent by mass, minimum	17.5	TZS 1107

5 HEAVY METAL CONTAMINANTS

Heavy metal contaminants in the fertilizer shall not exceed the limits given in Table 2 when determined by methods described in TZS 782.

Table 2 – Requirements for heavy metal contaminants

Element	Requirement
Arsenic, *mg/kg, max*	20
Cadmium, *mg/kg, max*	7
Mercury, *mg/kg, max*	0.1
Selenium, *mg/kg, max*	1
Lead, *mg/kg, max*	30
Chromium, *mg/kg, max*	500

6. STORAGE AND TRANSPORTATION

The fertilizer shall be stored and transported as prescribed in TZS 780.

7.0 SAMPLING AND TESTING

7.1 Sampling

Sampling of fertilizer shall be carried out as prescribed in TZS 159.

7.2 Testing

Testing of the fertilizer shall be done as prescribed in the methods of analysis indicated in respective standards.

8.0 PACKAGING AND LABELLING

8.1 Packaging

The fertilizer shall be packed in UV stabilized woven polypropylene (wpp) bags with 1 ply polyethylene (pe) inner lining. At the bottom of the bag, the woven fabric and the pe shall be hemmed then folded and secured together in lock stitches. At the top the inner lining and outer bag, shall be hemmed together. The bag shall be securely closed in lock stitches and without any opening. The stitching thread must be acid and heat resistant and of sufficient strength to hold the package secure and withstand multiple stages of handling. The outer *wpp* fabric shall measure not less than *10 x10* mesh weave of minimum *900* denier. The inner *pe* lining shall be of minimum of 70 microns thickness.

It is recommended that fertilizer is packed in 50 kg, 25kg, 5kg, 2kg, 1kg or as agreed to between the purchaser and supplier without compromising the packaging requirements.

8.2 Labelling

The bags shall be labeled in either Kiswahili or Kiswahili and Englishwith the following information: -

a) name of the fertilizer i.e. "potassium sulphate (sulphate of potash" fertilizer;

b) nutrient content;

c) name and address of the manufacturer and importer;

d) net content by mass in kg;

e) handling instructions – including the words “Use No hooks”;

f) production date and expiry date;

g) country of origin and

h) batch number.

8.3 The containers/bags shall also be marked with the TBS Standards Mark of Quality.

NOTE – The TBS Standards Mark of Quality may be used by the manufacturers only under licence from TBS. Particulars of conditions under which the licences are granted, may be obtained from TBS.

Annex A

Determination of potash content (flame photometric method)

A.1 Reagents

Potassium nitrate (KNO_3) or potassium chloride (KCl). Recrystallise reagent grade salt twice from water and dry for 5 hours at 105 ºC.

A.2 Preparation of solution

Dissolve 1.5058 g of sample in water (H_20) and dilute to 500 ml.

A.3 Preparation of standard curve

Dissolve 1.2931 g of KNO3 (or 0.9535 g KCl) in water and dilute to 500 ml (1 000 ppm K). Prepare standard solutions by dilution to cover a range of 0 ppm–80 ppm K at intervals of 10 ppm, adding appropriate amounts of lithium nitrate (LiNO3) if internal standard is to be used. Prepare standard curve of emission against concentration, adjusting instrument so that 50 ppm K gives reading near mid scale. Atomize portions of standard solutions until readings for the series are reproducible.

A. 4 Procedure

Transfer 10 ml aliquot of sample solution to 250 ml beaker. Dilute to 100 ml volume and mix (if internal standard instrument is used, add required $LiNO_3$ before diluting to volume). Atomize portions of sample several times to obtain reliable average reading for each solution.

Determine ppm K from standard curve (temperature of standard and sample solutions must not differ by more than 2 ºC).

Calculate % K_2O as follows:

0% – 30%, ppm K/2 = % K_2O

> 30%. ppm K/1 = % K_2O

Annex B

Determination of sodium content

B.1 Reagents

B.1.1 Concentrated hydrochloric acid, analytical grade.
B.1.2 Barium chloride solution, 12 per cent.
B.1.3 Ammonium carbonate solution, 1 M.
B.1.4 Perchloric acid.
B.1.5 Ethanol, 96 per cent.
B.1 6 Washing alcohol, prepared by mixing ethanol with 0.2 per cent (v/v) of perchloric acid.
B.1.7 Ammonium hydroxide, 2 M.
B.1.8 Magnesium uranyl acetate solution – Dissolve 90.0 g of crystallized uranyl acetate in 60 ml of glacial acetic acid and sufficient water by stirring and warming it to 70ºC. Dilute the solution to 1 litre. Dissolve 600 g of crystallized magnesium acetate in 60 ml of glacial acetic acid and sufficient water by stirring and warming to 70ºC.Dilute the solution to 1 litre. Mix the two solutions. Allow to stand for several hours. Filter off any residue. The final solution should be kept at 20ºC in flasks made of glass with very low sodium content. The solution should also be used at 20ºC.

B.2 Procedure

Weigh accurately about 10 g of the prepared sample, add a few milliliters of concentrated hydrochloric acid and 100 ml of water and heat to boiling in a beaker. To the boiling solution, add slowly in small quantities barium chloride solution. Heat for sometime and then cool. Transfer to a 250 ml volumetric flask and dilute to the mark with water, stir the solution and filter. Reject the first few milliliters of filtrate. Take exactly 10 ml of the filtrate and add a few milliliters of ammonium carbonate solution. Filter off the precipitated carbonates and wash the precipitate with water, the washings being added to the filtrate. Evaporate the filtrate and washings to dryness in a porcelain dish of 10 cm diameter and calcine gently. Add to the residue a small quantity of water and 6 ml of perchloric acid and evaporate almost to dryness in a water bath. Repeat the evaporation with perchloric acid twice again.

Cool the residue, add a few milliliters of ethanol and crush the moist mass to a fine state by using a glass pestle. Decant off the liquid. Repeat the crushing of the residue and decantation with further additions of washing alcohol, collecting all the decanted liquid. Transfer the precipitate to a small filter and wash thoroughly with ethanol adding these washings also to the decanted liquid. Neutralize the filtrate and washings with ammonium hydroxide and heat to dryness. Transfer the residue to a beaker with about 5 ml of water and add an excess of magnesium uranyl acetate, maintaining the temperature at 20ºC. Stir the precipitation and allow it to stand for half an hour at 20ºC. Decant off the clear solution through a sintered glass crucible which has been previously washed with ethanol, dried at 120°C ± 5ºC and weighed. Again add a small quantity of ethanol and repeat the decantation twice. Finally wash the precipitate with ethanol on the filter. Dry the crucible with the precipitate for half an hour at 120°C ± 5ºC, cool in desiccator and weigh.

B.3 Calculation

Sodium (as NaCl), per cent by mass (on dry basis)

$$97.05\ M_1$$

$$= \frac{\quad}{M}$$

where

M_1 = mass in g of the precipitate and
M = mass in g of the prepared sample taken for the test.

Annex C

Determination of chlorides other than ammonium chloride

C.1 Reagents

C.1.1 Standard silver nitrate solution – 0.1N
C.1.2 Concentrated nitric acid
C.1.3 Ferric ammonium sulphate solution - saturated in water and stabilized by addition of 50ml nitric acid.

C.2. Procedure

C.2.1 Dissolve 0.2g of the prepare sample in 40ml.
C.2.2 Add exactly 50ml of standard silver nitrate solution and 5ml of concentrated nitric acid.
C.2.3 Add 0.5ml of nitrobenzene and make up the volume of the mixture to exactly 100ml with water.
C.2.4 Take exactly 50ml of the solution and add 2ml of ferric ammonium sulphate solution.
C.2.5 Titrate the excess of silver nitrate in this portion with standard ammonium thiocyanate solution.
C.2.6 Carry out a blank test following the procedure given as above but without using the material.

C.3 Calculation

Total chloride (as Cl), per cent by mass (on dry basis)

$$= \frac{7.094\ (V_1 - V_2)\ N}{W}$$

where

V1 = Volume in ml of standard ammonium thiocyanate used in the blank determination
V1 = Volume in ml of standard ammonium thiocyanate solution used in the test with the material.
N = Normality of standard ammonium thiocyanate solution
W = Weight in gram, of the prepared sample taken for the test.