# ETHIOIPIAN STANDARD

# ES 717:2021

Second edition
xx-xx-2021



# Pesticides — Standard waters specification

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## Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for Pesticides (TC 19) and published by the Ethiopian Standards Agency (ESA).

The standard is Canceles and replaces of the Ethiopian Standard ES 717:2002 "*Pesticides - Lambda-cyhalothrin Part 2: Emulsifiable concentrates (EC) - Specification",* with some editorial changes without altering the technical contents in the former text.

In preparing this Ethiopian Standard reference has been made to the following:

- W. Dorbat and A Martijn, 1995,CIPAC Handbook, Volume F, Physico - Chemical Methods for Technical and Formulated Pesticides, Collaborative International Pesticides Analytical Council Limited*, Great Britain.

Acknowledgement is made for the use of information from the above publication.



* CIPAC: F, MT 18

# Pesticides —Standard waters specifications

## 1 Scope

This Ethioipian Standard specifies requirements and the method for the preparation of standard water A to G.

## 2 Normative 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.

ES 693:2002, *Pesticides — Terminology*.

ES 718:2002, *Pesticides — Reagents, indicators and solvents.*

ES 777:2002, *Pesticides — Determination of hardness of water.*

## 3 Definitions

For the purpose of this Ethioipian Standard terms defined in ES 693 shall apply.

## 4 General

**4.1** For standard water A to G, stock solutions of $Ca^{++}$ and $Mg^{++}$ are prepared, the working solutions are then made by dilution of these stock solutions.

**4.2** All solutions shall be stored in polyethylene containers.

**4.3** Working solutions shall be freshly prepared immediately before use.

**4.4** Determination of the hardness of water by EDTA titration shall be carried out in accordance with ES 777.

## 5 Reagents

### 5.1 Calcium carbonate ($CaCO_3$)

Containing not less than 99% calcium carbonate; dry for 2 h at $105^0$C before use.

### 5.2 Magnesium oxide (MgO)

Containing not less than 99% magnesium oxide; dry for 2 h at $105^0$C before use.

### 5.3 Sodium hydrogencarbonate ($NaHCO_3$)

Containing not less than 99% sodium hydrogencarbonate.

### 5.4 Ammonia solution ($NH_4OH$))

Approximately 1 mol/l (1N).

### 5.5 Hydrochloric acid (HCl)

1 mol/l (1N) and 0.1 mol/l (0.1N) standardized solutions; RE 14.2 and 14.1 (see ES 718)

### 5.6 Sodium hydrooxide (NaOH)

0.1 mol/l (0.1N) stadardized solution; RE 25.1 (see ES 718)

### 5.7 Methyl red indicator

0.1% m/v aqueous solution; RE 18 (see ES 718)

## 6 Stock solutions

### 6.1 Stock solution I, 0.04M $Ca^{++}$ solution

Weigh accurately calcium carbonate (4.000 g), and transfer to a 500 ml conical flask with a minimum of distilled water. Place a small filter funnel in the mouth of the flask and add slowly 1 mol/l hydrochloric acid (82.0 ml, measured from a burette), swirling the contents. When all the calcium carbonate has dissolved, dilute the solution to approximately 400 ml with distilled water, and boil gently to expel excess carbon dioxide. Cool the solution, add methyl red (2 drops) and neutralize to an intermediate orange colur with 1 mol/l ammonia solution, added dropwise.

Transfer the solution quantitatively to a 100 ml volumetric flask and make up to volume with distilled water. The solution should be stored in a polyethylene container.

One ml of this solution when diluted to 1000 ml gives a water containing 4 ppm hardness expressed as calcium carbonate.

### 6.2 Stock solution II, 0.04M $Ca^{++}$ solution

Weigh accurately magnesium oxide (1.613 g), and transfer to a 500 ml conical flask with a minimum of distilled water. Place a small filter funnel in the mouth of the flask and add slowly 1 mol/l hydrochloric acid (82.0 ml, measured from a burette), swirling the contents. When all the magnesium oxide has dissolved, dilute the solution to approximately 400 ml with distilled water. Add methyl red (2 drops) and neutralize to an intermediate orange colour with 1 mol/l ammonia solution, added dropwise. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with distilled water. The solution should be stored in a polyethylene container.

One ml of this solution when diluted to 1000 ml gives a water containing 4 ppm hardness expressed as calcium carbonate.

### 6.3 Stock solution III, 0.04M $Ca^{++}$ solution

Weigh accurately sodium hydrogencarbonate (84.01 g), dissolve in 80 ml distilled water, transfer to a 1000 ml volumetric flask and make up to volume with distilled water.

One ml of this solution when diluted to 1000 ml gives a water contianing the equivalent of 23 ppm of sodium.

### 6.4 Stock solution IV, 0.04M $Ca^{++}$ solution

Weigh accurately calcium carbonate (20.00 g), and transfer to a 1000 ml conical flask with a minimum of distilled water. Place a small filter funnel in the mouth of the flask and add slowly 1 mol/l hydrochloric acid (410 ml), swirling

the contents. When all the calcium carbonate has dissolved, dilute the solution to approximately 800 ml with distilled water, and boil gently to expel excess carbon dioxide. Cool the solution, add methyl red (2 drops) and neutralize to an intermediate orange colour with 1 mol/l ammonia solution, added dropwise. Transfer quantitatively to a 1000 ml volumetric flask and make up to volume with distilled water. The solution should be stored in a polyethylene container.

One ml of this solution when diluted to 1000 ml gives a water containing 20 ppm hardness expressed as calcium carbonate.

### 6.5 Stock solution V, 0.04M $Ca^{++}$ solution

Weigh accurately magnesium oxide (8.065 g), and transfer to a 1000 ml conical flask with a minimum of distilled water. Place a small funnel in the mouth of the flask and add slowly 1 mol/l hydrochloric acid (410 ml), swirling the conmtents. When all the magnesium oxide has dissolved, dilute the solution to about 800 ml with distilled water. Add methyl red (2 drops) and neutralize to an intermediate orange colour with 1 mol/l ammonia solution, added dropwise. Transfer quantitatively to a 1000 ml vlumetric flask and make up to volume with distilled water. The solution should be stored in a polyethylene container.

One ml of this solution when diluted to 1000 ml gives a water containing 20 ppm hardness expressed as calcium carbonate.

## 7 Apparatus

pH meter with suitable electrode assembly.

## 8 Preparation of working solutions (Notes 1 and 2)

### 8.1 Standard water A

**8.1.1** Requirments

**8.1.1.1** 20 ppm hardness.

**8.1.1.2** pH 5.0 - 6.0.

**8.1.1.3** $Ca^{++}$: $Mg^{++}$ = 1:1

**8.1.2 Procedure**

Pipette solution I (2.5 ml) and solution II (2.5 ml) into a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH-meter, adjust to pH 5.0 to 6.0 (Note 3) by the dropwise addition of 0.1 mol/l sodium hydroxide or 0.1 mol/l (0.1N) hydrochloric acid as appropriate. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

NOTE 1: All working solutions should be stored in polyethylene containers and must be freshly made up before use, as $Ca^{++}$ and $Mg^{++}$ will be lost from solution on standing..

NOTE 2: It is recommended that de-ionized water be used for the preparation of all working solutions, since distilled water may have a pH 5.0, requiring excessive addition of sodium hydroxide for pH adjustment.

NOTE 3: The total hardness of water is calculated by the following formula: Total hardness as ppm calcium carbonate = 2.495 X ppm $Ca^{++}$ + 4.115 X ppm $Mg^{++}$..

### 8.2 Standard water B

**8.2.1** Requirments

**8.2.1.1** 20 ppm hardness.

**8.2.1.2** pH 8.0 - 9.0.

**8.2.1.3** $Ca^{++}$: $Mg^{++}$ = 1:1

### 8.2.2 Procedure

Pipette solution I (4.0 ml) and solution II (1.0 ml) and solution III (2.0 ml) into a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH-meter, adjust to pH 8.0 to 9.0 (Note 4) by the dropwise addition of 0.1 mol/l sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

NOTE 4: The pH after adjustment should be near the middle of the stated range, to allow for any slight pH change on standing.

## 8.3 Standard water C

### 8.3.1 Requirments

**8.3.1.1** 500 ppm hardness.

**8.3.1.2** pH 7.0 - 8.0.

**8.3.1.3** $Ca^{++}$: $Mg^{++}$ = 1:1

### 8.3.2 Procedure

Pipette solution I (100 ml) and solution II (25 ml) into a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH-meter, adjust to pH 7.0 to 8.0 (Note 4) by the dropwise addition of 0.1 mol/l sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 4).

## 8.4 Standard water D

### 8.4.1 Requirments

**8.4.1.1** 342 ppm hardness.

**8.4.1.2** pH 6.0 - 7.0.

**8.4.1.3** $Ca^{++}$: $Mg^{++}$ = 1:1

### 8.4.2 Procedure

Measure, from a burette, solution I (68.5 ml) and solution II (17.0 ml)into a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH meter, adjust to pH 6.0 - 7.0 (Note 4) by the dropwise addition of 0.1 mol/l sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

## 8.5 Standard water E

### 8.5.1 Requirments

**7.5.1.1** 1500 ppm hardness.

**7.5.1.2** pH 7.0 - 8.0.

**7.5.1.3** $Ca^{++}$: $Mg^{++}$ = 1:1

### 8.5.2 Procedure

Measure, from a burette, solution IV (60 ml) and solution V (15.0 ml) into a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH meter, adjust to pH 7.0 - 8.0 (Note 4) by the dropwise addition of 0.1 mol/l

sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

## 8.6 Standard water F

### 8.6.1 Requirments

**8.6.1.1** 5000 ppm hardness.

**8.6.1.2** pH 6.0 - 7.0.

**8.6.1.3** $Ca^{++}$ only

### 8.6.2 Procedure

Transfer solution IV (250 ml) to a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH meter, adjust to pH 6.0 - 7.0 (Note 4) by the dropwise addition of 0.1 mol/l sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

## 8.7 Standard water G

### 8.7.1 Requirments

**8.7.1.1** 8000 ppm hardness.

**8.7.1.2** pH 6.0 - 7.0.

**8.7.1.3** $Mg^{++}$ only

### 8.7.2 Procedure

Transfer solution V (400 ml) to a 1000 ml beaker and dilute to about 800 ml with de-ionized water. Using a pH meter, adjust to pH 6.0 - 7.0 (Note 4) by the dropwise addition of 0.1 mol/l sodium hydroxide. Transfer the solution quantitatively to a 1000 ml volumetric flask and make up to volume with de-ionized water (Note 2).

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Ethiopian Standards Agency

## *Organization and Objectives*

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

***ESA's objectives are:-***

- Develop Ethiopian standards and establish a system that enable to check whether goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

## Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes. Orders for all Ethiopian Standards, International Standards and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.



International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for Standardization (ARSO).

***<u>More Information</u>?***

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