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Kakovost tal - Ugotavljanje suhe snovi in vsebnosti vode na osnovi mase - Gravimetrijska metoda

Soil quality -- Determination of dry matter and water content on a mass basis -- Gravimetric method

Qualité du sol -- Détermination de la teneur pondérale en matière sèche et en eau -- Méthode gravimétrique

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INTERNATIONAL STANDARD

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Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method

Qualité du sol — Détermination de la teneur en matière sèche et en eau pondérale — Méthode gravimétrique

Reference number
ISO 11465:1993(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11465 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

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Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method

1 Scope

This International Standard specifies a method for the determination of the dry matter content and water content of soil samples on a mass basis.

This method can be applied to all types of soil samples. Different procedures are specified for air-dried soil samples, for example samples pretreated according to ISO 11464, and for field-moist soil samples.

For the determination of soil water content on a volume basis, refer to ISO 11461.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 11461:—[1], *Soil quality — Determination of soil water content on a volume basis — Gravimetric method.*

ISO 11464:—[1], *Soil quality — Pretreatment of samples for physico-chemical analyses.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 dry matter content on a mass basis w_{dm}: Dry residue of soil, expressed as a percentage by mass, after drying according to this International Standard.

3.2 water content on a dry mass basis, w_{H_2O}: Mass of water evaporating from the soil when dried to constant mass at 105 °C, divided by the dry mass of the soil and multiplied by 100.

3.3 constant mass: Mass reached when, during the drying process, the difference between two successive weighings of the cooled sample, with an interval of 4 h between them, does not exceed 0,1 % (*m/m*) of the last determined mass.

NOTE 1 Usually 16 h to 24 h is sufficient for drying most soils to constant mass, but certain soil types and large samples will require longer.

4 Principle

Soil samples are dried to constant mass at 105 °C ± 5 °C. The difference in mass of an amount of soil before and after the drying procedure is used to calculate the dry matter and water contents on a mass basis.

5 Apparatus

5.1 Drying oven, thermostatically controlled with forced air ventilation and capable of maintaining a temperature of 105 °C ± 5 °C.

5.2 Desiccator, with an active drying agent.

5.3 Analytical balance, accuracy 10 mg.

1) To be published.

5.4 Container (moisture box) with lid, of capacity 25 ml to 100 ml for air-dried soil samples and at least 100 ml for field-moist soil samples, and made of waterproof material that does not absorb moisture.

5.5 Spoon.

6 Laboratory sample

Use air-dried soil samples, for example samples pretreated according to ISO 11464, or field-moist soil samples taken according to the appropriate International Standards.

7 Procedure

WARNING — With soil samples from contaminated soils, special measures must be taken. It is important to avoid any contact with the skin and special measures must be taken during the drying process to prevent contamination of the laboratory atmosphere and other samples (ventilation, removal of the air, etc.).

The procedures mentioned in 7.1 and 7.2 must be performed as quickly as possible to minimize evaporation.

7.1 Procedure for air-dried soil samples

7.1.1 Dry a container with lid (5.4) at 105 °C ± 5 °C and then cool it, with the lid closed, in a desiccator (5.2) for at least 45 min. Determine the mass (m_0) of the closed container, with an accuracy of 1 mg.

Using a spoon (5.5), transfer 10 g to 15 g of air-dried soil to this container.

Determine the mass (m_1) of the closed container and soil, with an accuracy of 1 mg.

7.1.2 Dry the container and soil in a drying oven (5.1) at 105 °C until constant mass is reached. Dry the lid at the same time.

NOTES

2 Care should be taken that the very light soil particles are not removed from the container by a draught or wind.

3 Decomposition of organic matter can, in general, be neglected at this temperature. However, for soil samples with a high organic matter content (> 10 % (*m/m*)), for example peaty soils, the method of drying should be adapted. In this case, the sample should be dried to constant mass at 50 °C. Use of a vacuum will speed up this operation.

4 Some minerals similar to gypsum lose water of crystallization at a temperature of 105 °C.

5 If volatile (organic) substances are present, this method will not give a reliable determination of the water content.

7.1.3 Cool the container, with the lid closed, in a desiccator for at least 45 min.

7.1.4 Remove the container from the desiccator and immediately determine the mass (m_2) of the closed container containing the oven-dried soil, with an accuracy of 1 mg.

7.2 Procedure for field-moist soil samples

7.2.1 Place the soil on a clean surface that does not absorb moisture (e.g. a glass plate) and mix well. Remove stones, twigs, etc. with a diameter greater than 2 mm.

NOTE 6 When soil samples have to be analysed for organic micropollutants, these samples should undergo special pretreatment. During these procedures, stones, twigs, etc. are not in principle removed from the sample. Therefore, the dry matter content of those soil samples should be determined according to the procedure specified in this International Standard without removal of stones, twigs, etc.

7.2.2 Dry a container with lid (5.4) at 105 °C ± 5 °C and then cool it, with the lid closed, in a desiccator (5.2) for at least 45 min. Determine the mass (m_0) of the closed container with an accuracy of 10 mg.

Using a spoon (5.5), transfer 30 g to 40 g of soil to this container.

Determine the mass (m_1) of closed container and soil, with an accuracy of 10 mg.

7.2.3 Dry the container and soil in a drying oven (5.1) at 105 °C until constant mass is reached. Dry the lid at the same time.

NOTE 7 See notes 2 to 5 in 7.1.2.

7.2.4 Cool the container, with the lid closed, in a desiccator for at least 45 min.

7.2.5 Remove the container from the desiccator and immediately determine the mass (m_2) of the closed container containing the oven-dried soil, with an accuracy of 10 mg.

8 Expression of results

The water content is calculated on a basis of oven-dried soil.

Calculate the dry matter content (w_{dm}) or water content on a dry mass basis (w_{H_2O}), expressed as percentages by mass, to an accuracy of 0,1 % (*m/m*), using the following formulas:

$$w_{dm} = \frac{m_2 - m_0}{m_1 - m_0} \times 100$$

$$w_{H_2O} = \frac{m_1 - m_2}{m_2 - m_0} \times 100$$

where

m_0 is the mass, in grams, of the empty container with lid;

m_1 is the mass, in grams, of the container plus air-dried or field-moist soil;

m_2 is the mass, in grams, of the container plus oven-dried soil.

NOTES

8 Recalculation of a weighed amount of air-dried or field-moist soil (x) to oven-dried soil (y) can be carried out using the following formula:

$$y = x \times \frac{100}{(100 + w_{H_2O})}$$

9 The water content, calculated on a basis of oven-dried soil, may be greater than 100 %.

9 Repeatability

The repeatability of separate duplicate determinations shall satisfy the conditions given in tables 1 and 2.

10 Test report

The test report shall contain the following information:

a) a reference to this International Standard;

b) a complete identification of the sample;

c) the results of the determination in terms of the dry matter content (w_{dm}) or the water content on a basis of dry mass (w_{H_2O}) with an accuracy of 0,1 % (*m/m*);

d) particular characteristics of the soil (e.g. the presence of gypsum and, if field-moist soil samples are used, the presence of gravel, twigs, etc.);

e) any details not specified in this International Standard or which are optional, and any other factors which may have affected the results.

Table 1 — Repeatability of w_{dm} and w_{H_2O} in air-dried soil

Dry matter content, w_{dm} % (*m/m*)		Water content, w_{H_2O} % (*m/m*)		Acceptable difference
greater than	up to and including	greater than	up to and including	
96	—	0	4,0	0,2 % (*m/m*) absolute
0	96	4,0	—	0,5 % of the mean value

Table 2 — Repeatability of w_{dm} and w_{H_2O} in field-moist soil

w_{dm} and w_{H_2O} % (*m/m*)		Acceptable difference
greater than	up to and including	
0	30	1,5 % (*m/m*) absolute
30	—	5 % of the mean value