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Soil quality — Determination of the water-retention characteristic — Laboratory methods

Qualité du sol — Détermination de la caractéristique de la rétention en eau — Méthodes de laboratoire

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Contents

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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 11274 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 5, *Physical methods*.

Annexes A and B of this International Standard are for information only.

Introduction

Soil water content and matric pressure are related to each other and determine the water-retention characteristics of a soil. Soil water which is in equilibrium with free water is at zero matric pressure (or suction) and the soil is saturated. As the soil dries, matric pressure decreases (i.e. becomes more negative), and the largest pores empty of water. Progressive decreases in matric pressure will continue to empty finer pores until eventually water is held in only the finest pores. Not only is water removed from soil pores, but the films of water held around soil particles are reduced in thickness. Therefore a decreasing matric pressure is associated with a decreasing soil water content [5], [6]. Laboratory or field measurements of these two parameters can be made and the relationship plotted as a curve, called the soil water-retention characteristic. The relationship extends from saturated soil (approximately 0 kPa) to oven-dry soil (about -10^6 kPa).

The soil water-retention characteristic is different for each soil type. The shape and position of the curve relative to the axes depend on soil properties such as texture, density and hysteresis associated with the wetting and drying history. Individual points on the water-retention characteristic may be determined for specific purposes.

The results obtained using these methods can be used, for example:

- to provide an assessment of the equivalent pore size distribution (e.g. identification of macro- and micropores);
- to determine indices of plant-available water in the soil and to classify soil accordingly (e.g. for irrigation purposes);
- to determine the drainable pore space (e.g. for drainage design, pollution risk assessments);
- to monitor changes in the structure of a soil (caused by e.g. tillage, compaction or addition of organic matter or synthetic soil conditioners);
- to ascertain the relationship between the negative matric pressure and other soil physical properties (e.g. hydraulic conductivity, thermal conductivity);
- to determine water content at specific negative matric pressures (e.g. for microbiological degradation studies);
- to estimate other soil physical properties (e.g. hydraulic conductivity).

Soil quality — Determination of the water-retention characteristic — Laboratory methods

1 Scope

This International Standard specifies laboratory methods for determination of the soil water-retention characteristic.

This International Standard applies only to measurements of the drying or desorption curve.

Four methods are described to cover the complete range of soil water pressures as follows:

a) method using sand, kaolin or ceramic suction tables for determination of matric pressures from 0 kPa to – 50 kPa;

b) method using a porous plate and burette apparatus for determination of matric pressures from 0 kPa to – 20 kPa;

c) method using a pressurized gas and a pressure plate extractor for determination of matric pressures from – 5 kPa to – 1500 kPa;

d) method using a pressurized gas and pressure membrane cells for determination of matric pressures from – 33 kPa to – 1500 kPa.

Guidelines are given to select the most suitable method in a particular case.

2 Definitions

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

2.1
soil water-retention characteristic
relation between soil water content and soil matric head of a given soil sample

2.2
matric pressure
amount of work that must be done in order to transport, reversibly and isothermally, an infinitesimal quantity of water, identical in composition to the soil water, from a pool at the elevation and the external gas pressure of the point under consideration, to the soil water at the point under consideration, divided by the volume of water transported