

Soil quality - Determination of the effects of pollutants on soil flora - Leaf fatty acid composition of plants to assess soil quality (ISO 21479:2019)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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| See Eesti standard EVS-EN ISO 21479:2020 sisaldab Euroopa standardi EN ISO 21479:2020 ingliskeelset teksti. | This Estonian standard EVS-EN ISO 21479:2020 consists of the English text of the European standard EN ISO 21479:2020. |
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English Version

Soil quality - Determination of the effects of pollutants on
soil flora - Leaf fatty acid composition of plants to assess
soil quality (ISO 21479:2019)

Qualité du sol - Détermination des effets des polluants
sur la flore du sol - Composition en acides gras foliaires
des plantes utilisées pour évaluer la qualité du sol (ISO
21479:2019)

Bodenbeschaffenheit - Bestimmung der Wirkungen
von Schadstoffen auf die Bodenflora -
Zusammensetzung von Fettsäuren in Blättern zur
Beurteilung der Bodenbeschaffenheit (ISO
21479:2019)

This European Standard was approved by CEN on 13 April 2020.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of ISO 21479:2019 has been prepared by Technical Committee ISO/TC 190 "Soil Quality" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 21479:2020 by Technical Committee CEN/TC 444 "Environmental characterization of solid matrices" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2020, and conflicting national standards shall be withdrawn at the latest by November 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 21479:2019 has been approved by CEN as EN ISO 21479:2020 without any modification.

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 4, *Biological characterization*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Among the more than 150 ISO standards on soil quality that have been developed, less than 40 address living organisms, and among them only five address higher plants. This is despite the importance of monitoring the adverse effects of soil quality on living organisms.

One of these five standards addresses genotoxicity^[1], and four of them address emergence and/or growth inhibition^[2-5]. It therefore appears that these International Standards are focused either on a very specific effect (genotoxicity), or on effects great enough to induce developmental (and, therefore, visible) phenotypes (emergence or growth inhibition of young seedlings) in soils sampled in the field. Hence, more sensitive/earlier bio-indicators of the adverse effects of pollutants on plants, such as the “Omega-3 index”, are needed.

The assessment of soil contaminant effects by the Omega-3 index is based on the leaf fatty acid composition of angiosperm species grown in sites of concern. The use of the Omega-3 index has proven to be appropriate for highlighting the presence of metallic and organic contaminants (herbicides, etc.) in the soils. With this aim, physical and chemical properties (pH, N/P/K content) of soils should also be determined because plant fatty acid composition may vary as a function of nutrient content^[12] and pH may influence chemical compound bioavailability. It should be noted that this bio-indicator has proved to be more sensitive (i.e. responding to lower doses of contaminants) than the biometric parameters of rate of germination and biomass^{[6][14]}. Hence, this makes it possible to gain evidence of adverse effects of soils on plants that could not be highlighted by the rate of germination or biomass. Additionally, for in situ assessment purposes, it can be difficult to observe evident effects on the rate of germination and/or biomass of plants.

It should be noted that from a practical point of view, especially with plant species harvested in the field, and in comparison with other bio-indicators, the Omega-3 index presents several advantages.

- For fatty acid analysis, only 20 mg to 50 mg of fresh leaf tissues per sample are needed. Hence, this is not destructive for plants, and there is not a problem with getting enough tissues of one species from a given area.
- Samples of plant tissues can be stored in methanol for several days at room temperature prior to analyses.
- It is not necessary to find a particular species at a site, and that a priori any species (often chosen among the most representative) can be sampled ([Clause 6](#)).

The results of a ring test performed by six individual laboratories to assess the reproducibility and the repeatability of the method are shown in [Annex A](#). The results obtained by the same investigator with the same sample and the same measuring instrument over a short period of time are shown in [Annex B](#).

Soil quality — Determination of the effects of pollutants on soil flora — Leaf fatty acid composition of plants used to assess soil quality

WARNING — Contaminated soils can contain unknown mixtures of toxic, mutagenic, or otherwise harmful chemicals or infectious micro-organisms. Occupational health risks can arise from dust or evaporated chemicals. Furthermore, plants might take up chemicals from the soil and safety measures should also be considered when handling the test plants.

1 Scope

This document describes a method to compare the quality of soils by determining the fatty acid composition of the leaves of plant species grown in these soils.

This method does not make it possible to determine an optimal value of the Omega-3 index and, therefore, cannot be used to determine the intrinsic quality of a soil from a specific area (regarded as homogeneous). The method can only be used to compare the quality of soils between various areas.

This method is applicable to:

- soils from contaminated sites;
- amended soils;
- soils after remediation;
- soil with waste products (e.g. slurry, manure, sludge or composts).

Alternatively, the quality of soils can be assessed by determining the Omega-3 index of *Lactuca sativa* seedlings grown in these soils under controlled conditions (i.e. phytotron chamber) and by comparing these values to those obtained from control soils (see [Annex B](#)).

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

Omega-3 index

$\% \text{C18:3} / (\% \text{C18:0} + \% \text{C18:1} + \% \text{C18:2})$

Note 1 to entry: The Omega-3 index has no unit.