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English Version

**Soil quality - Determination of soil microbial diversity - Part 1:
Method by phospholipid fatty acid analysis (PLFA) and
phospholipid ether lipids (PLEL) analysis (ISO/TS 29843-1:2010)**

Qualité du sol - Détermination de la diversité microbienne
du sol - Partie 1: Méthode par analyse des acides gras
phospholipidiques (PLFA) et par analyse des lipides éther
phospholipidiques (PLEL) (ISO/TS 29843-1:2010)

Bodenbeschaffenheit - Bestimmung der Diversität von
Bodenmikroorganismen - Teil 1: Verfahren mittels
Phospholipidfettsäure(PLFA)-Analyse und
Phospholipidetherlipid(PLEL)-Analyse (ISO/TS 29843-
1:2010)

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Foreword

The text of ISO/TS 29843-1:2010 has been prepared by Technical Committee ISO/TC 190 "Soil quality" of the International Organization for Standardization (ISO) and has been taken over as CEN ISO/TS 29843-1:2014 by Technical Committee CEN/TC 345 "Characterization of soils" the secretariat of which is held by NEN.

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Endorsement notice

The text of ISO/TS 29843-1:2010 has been approved by CEN as CEN ISO/TS 29843-1:2014 without any modification.

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Introduction

Phospholipids are essential components of membranes of all living cells, and their fatty acid (PLFA: phospholipid fatty acids) or ether-linked isoprenoid side chains (PLEL: phospholipid ether lipid) allow for taxonomic differentiation within complex microbial communities (References [5] and [7]). This approach is now well established in soil ecology and serves as a phenotypic and thus complementary tool to genotypic (molecular genetic) approaches for determining microbial diversity.

Different methodologies for determination of soil fatty acids are available. These methodologies present different levels of complexity when applied and provide different levels of resolution in the description of soil microbial communities.

The determination of total PLFA and PLEL provides a quantitative measure of the viable biomass of soil: microorganisms of all three domains of the biosphere (bacteria, fungi and archaeobacteria). Viable microbes have an intact membrane, which contains phospholipids. Cellular enzymes hydrolyze and release the phosphate group within minutes or hours following cell death (Reference [6]).

Apart from taxonomic descriptions, the PLFA technique enables the determination of physiological changes within microbial consortia. For instance, the monoenic PLFA 16:1 ω 7c and 18:1 ω 7c are increasingly converted to the cyclopropyl fatty acids cy17:0 and cy19:0 in Gram-negative bacteria in response to environmental stress (Reference [2]).

Besides the method described in this part of ISO/TS 29843, other methods for the determination of PLFA are available (References [3] and [6]). With these methods, only bacterial and fungal PLFA can be estimated; the determination of hydroxy-substituted fatty acids (PLOH), non-ester-linked (NEL) fatty acids and PLEL is not possible.

Soil quality — Determination of soil microbial diversity —

Part 1:

Method by phospholipid fatty acid analysis (PLFA) and phospholipid ether lipids (PLEL) analysis

1 Scope

This part of ISO/TS 29843 specifies an extended method for the extraction and determination of both phospholipid fatty acids (PLFA) and phospholipid ether lipids (PLEL) from soils.

ISO/TS 29843-2 specifies a simple method for the extraction of only PLFA from soils.

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.

ISO 10381-6, *Soil quality — Sampling — Part 6: Guidance on the collection, handling and storage of soil under aerobic conditions for the assessment of microbiological processes, biomass and diversity in the laboratory*

3 Abbreviated terms

FAME	fatty acid methyl ester(s)
(EL-)PLFA	(ester-linked) phospholipid fatty acid(s)
PLEL	phospholipid ether lipid(s)
SATFA	saturated fatty acid(s)
MUFA	mono-unsaturated fatty acid(s)
PUFA	poly-unsaturated fatty acid(s)
PLOH	hydroxy-substituted fatty acid(s)
NEL-PLFA	non-ester-linked phospholipid fatty acid(s)
UNSFA	unsubstituted fatty acid(s)
UNOH	hydroxy-substituted fatty acid(s)
GC/MS	gas chromatography/mass spectrometry