
**Soil quality — Effects of pollutants on
mycorrhizal fungi — Spore germination
test**

*Qualité du sol — Effets des polluants vis-à-vis des champignons
mycorrhizogènes — Essai de germination des spores*



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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.

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The main task of technical committees is to prepare International Standards. 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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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

ISO/TS 10832 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 4, *Biological methods*.

Introduction

Mycorrhizal fungi are important components of the soil microbial community and key organisms in plant/soil systems. The root symbiosis they form represents a direct link between the soil and the large majority (80 %) of vascular plant species, in natural and agricultural environments. Mycorrhizal fungi provide several benefits to the host plants, including enhanced growth, improved mineral nutrition, greater drought resistance, and protection against pathogens and heavy metal stress.

Several studies have shown that mycorrhizal fungi are sensitive to pollutants such as metallic trace elements and polycyclic aromatic hydrocarbons, and to sewage sludges even when no phytotoxic effects on the host plant are observed. As mycorrhizal fungi fulfil most of the criteria for bioindicator organisms (ubiquitous in soil, sensitive to pollutants, ecologically relevant role in plant health and ecosystems), it appeared important to take them into account in hazard and environmental risk assessments linked to pollutants, contaminated soils and to the use of sewage sludge in agriculture.

Spore germination by an arbuscular mycorrhizal fungus, *Glomus mosseae*, makes up the basis of the proposed test. The first step of the symbiosis is taken into account in this test, whereas another test based on root colonization of the host plant is also under investigation.

This test can be directly performed with sludges or soils without any extraction step.

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Soil quality — Effects of pollutants on mycorrhizal fungi — Spore germination test

1 Scope

This Technical Specification specifies a method to evaluate the effects of pollutants on spore germination of a mycorrhizal fungus, *Glomus mosseae*. This direct acute toxicity bioassay allows the evaluation of potential effects of pollutants and contaminated soils on beneficial soil microorganisms important for plant growth within the concept of sustainable agriculture.

This Technical Specification is applicable to

- chemical substances, and
- contaminated soils, waste and soil-waste mix.

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*

ISO 10390, *Soil quality — Determination of pH*

ISO 11263, *Soil quality — Determination of phosphorus — Spectrometric determination of phosphorus soluble in sodium hydrogen carbonate solution*

ISO 11268-1, *Soil quality — Effects of pollutants on earthworms (Eisenia fetida) — Part 1: Determination of acute toxicity using artificial soil substrate*

ISO 11274, *Soil quality — Determination of the water-retention characteristic — Laboratory methods*

ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

3 Terms, definitions and abbreviated terms

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

3.1

mycorrhizal fungus

ubiquitous microorganism forming symbiotic association with the roots of vascular plant species