
**Soil quality — Determination of
abundance and activity of soil microflora
using respiration curves**

*Qualité du sol — Détermination de l'abondance et de l'activité de la
microflore du sol à l'aide de courbes de respiration*





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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

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 17155 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 4, *Biological methods*.

This second edition cancels and replaces the first edition (ISO 17155:2002), which has been technically revised.

Soil quality — Determination of abundance and activity of soil microflora using respiration curves

1 Scope

This International Standard specifies a test method for determining the activity of active aerobic, heterotrophic microbial biomass in soils. This method is applicable to the monitoring of soil quality and to the evaluation of the ecotoxic potential of soils and soil materials. It is also applicable for soils sampled along contamination gradients in the field and to soils that are contaminated experimentally in the field or in the laboratory.

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 10694, *Soil quality — Determination of organic and total carbon after dry combustion (elementary analysis)*

ISO 11277, *Soil quality — Determination of particle size distribution in mineral soil material — Method by sieving and sedimentation*

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

ISO 14238, *Soil quality — Biological methods — Determination of nitrogen mineralization and nitrification in soils and the influence of chemicals on these processes*

3 Terms and definitions

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

3.1

basal respiration rate

R_B

constant mass of CO₂ released or mass of O₂ consumed per unit mass of soil per unit time without substrate addition

NOTE See Figure 1 for a typical basal respiration curve.

3.2

substrate-induced respiration rate

R_S

constant mass of CO₂ released or mass of O₂ consumed per unit mass of soil per unit time shortly after addition of a carbon substrate

NOTE 1 See Figure 1 for a typical substrate-induced respiration curve.

NOTE 2 If glucose is used as a carbon substrate, microbial biomass can be determined from the substrate-induced respiration rate (see ISO 14240-1^[1]).

3.3 respiratory activation quotient

Q_R

basal respiration rate divided by substrate-induced respiration rate

$$Q_R = \frac{R_B}{R_S} \quad (1)$$

3.4 specific growth rate

μ

exponent representing respiration rate per unit of time during the exponential phase of growth

NOTE See Equation (3).

3.5 time to the peak maximum

t_{peakmax}

time from addition of substrate to the maximum respiration rate

NOTE 1 See Figure 1.

NOTE 2 The time to the peak maximum also reflects the viability of the growing organisms.

3.6 cumulative CO₂ evolution or O₂ consumption

C_R

total area bounded by the line of the soil respiration rate curve to the time axis from time of the addition of substrate to the time of peak maximum (t_{peakmax})

NOTE See Figure 1.

3.7 soil material

material composed of excavated soil, dredged materials, manufactured soils, treated soils or fill materials

4 Principle

The CO₂ production or O₂ consumption (respiration rate) from unamended soils as well as the decomposition of an easily degraded substrate (glucose + ammonium + phosphate) is monitored regularly (e.g. every hour). From the CO₂ production or O₂ consumption data, the different microbial parameters (basal respiration, substrate-induced respiration, respiratory activation quotient, t_{peakmax} , C_R) can be calculated.

5 Reagents

5.1 Glucose, C₆H₁₂O₆.

5.2 Potassium dihydrogenphosphate, KH₂PO₄.

5.3 Diammonium sulfate, (NH₄)₂SO₄.

5.4 Substrate, consisting of a mixture of 80 g of glucose (5.1), 13 g of diammonium sulfate (5.3), and 2 g of KH₂PO₄ (5.2), which is thoroughly ground and mixed in a mortar.

6 Apparatus

Ordinary laboratory equipment and 6.1.