

Soil quality —

Part 4: Biological methods —

Section 4.3 Effects of pollutants on soil flora —

Subsection 4.3.1 Method for the measurement of inhibition of root growth

UDC 631.427.12

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Environment and Pollution Standards Policy Committee (EPC/-) to Technical Committee EPC/48, upon which the following bodies were represented:

- Association of Consulting Scientists
- Association of County Councils
- Association of Environmental Consultants
- Association of Public Analysts
- British Gas plc
- British Geological Survey
- British Society of Soil Science
- Chemical Industries' Association
- Confederation of British Industry
- Department of Agriculture Northern Ireland
- Department of the Environment
- Department of the Environment (Drinking Water Inspectorate)
- Department of Trade and Industry
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Institute of Groundsmanship
- Institute of Terrestrial Ecology
- Institution of Environmental Health Officers
- Institution of Water and Environmental Management
- Macaulay Land Use Research Institute
- Ministry of Agriculture, Fisheries and Food
- Soil Survey and Land Research Centre
- Water Research Centre
- Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Agrochemicals Association Ltd.
- British Wood Preserving and Damp-proofing Association
- Landscape Institute
- Soap and Detergent Industry Association
- Society of Chemical Industry
- Society of Environmental Toxicology and Chemistry
- University of East London
- University of Southampton

This British Standard, having been prepared under the direction of the Environment and Pollution Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 March 1994

© BSI 09-1999

The following BSI references relate to the work on this standard:
Committee reference EPC/48
Draft for comment 92/54392 DC

ISBN 0 580 22996 3

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Introduction	1
1 Scope	1
2 Normative reference	1
3 Principle	1
4 Test plants and materials	1
5 Methods	2
6 Expression of results	3
7 Test report	3
Annex A (informative) Adaptation of the method for added substances	4
Annex B (informative) Recommended methods for incorporation of chemicals into soils	4
Annex C (informative) Examples of statistical treatment of results	4
Annex D (informative) Example of test results	6
Annex E (informative) Results of interlaboratory test of root elongation	6
Annex F (informative) Protocol for ring test	7
Table E.1 — Statistical data	6
List of references	Inside back cover

National foreword

This Subsection of BS 7755 has been prepared under the direction of the Environment and Pollution Standards Policy Committee. It is identical with ISO 11269-1:1993 *Soil quality — Determination of the effects of pollutants on soil flora — Part 1: Method for the measurement of inhibition of root growth*, published by the International Organization for Standardization (ISO). ISO 11269-1 was prepared by Subcommittee 4, Biological methods, of Technical Committee ISO/TC 190, Soil quality, with the active participation and approval of the UK.

BS 7755 is being published in a series of Parts subdivided into Sections and Subsections that will generally correspond to particular International Standards. Other Parts of BS 7755 are, or will be, as follows.

- *Part 1: Terminology and classification;*
- *Part 2: Sampling;*
- *Part 3: Chemical methods;*
- *Part 4: Biological methods;*
- *Part 5: Physical methods.*

Section 4.3 of BS 7755-4 is one of a group of standards dealing with biological tests on soil. Other Sections in this Part are, or will be, as follows.

- *Section 4.1: Biodegradability;*
- *Section 4.2: Effects of pollutants on soil fauna;*
- *Section 4.4: Effects of pollutants on soil microorganisms.*

Section 4.3 is, or will be, divided into the following Subsections.

- *Subsection 4.3.1: Method for the measurement of inhibition of root growth;*
- *Subsection 4.3.2: Method for the measurement of effects of chemicals on the emergence and growth of higher plants;*
- *Subsection 4.3.3: Method for the measurement of germination;*
- *Subsection 4.3.4: Guidance on field testing using higher plants.*

Cross-references

The Technical Committee has reviewed the provisions of the draft of ISO 11274, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

Chemical analysis of soil samples or waste materials disposed of on land provides substantial evidence of the suitability or otherwise of the soil for arable production, or the potential environmental risk resulting from the disposal of wastes such as sewage sludge on farmland. There is also a need to assess the quality of soil after reclamation of industrial sites and colliery tips or when capping landfill sites. As the ability of the soil to grow crops is the main criterion, a rapid growth test has been developed based on seedling growth in controlled environmental conditions.

Two major prerequisites of a phytotoxicity test are that it provides consistently reliable results and that it can be used at any time of the year. It is therefore essential to raise seeds in a controlled environment to ensure optimal growing conditions which can be maintained for any number of tests, producing reproducible results over a long period of time.

The test method described in this part of ISO 11269 may be used to compare soils, to monitor changes in their activity or to determine the effect of added substances.

1 Scope

This part of ISO 11269 describes a preliminary test for the rapid estimation of soil quality by comparing the rate of growth of roots of a specified plant under standard conditions with that in a test soil.

The method is applicable to all soils, soil forming materials, waste residues or chemicals which may be applied to soil, except where the contaminant is highly volatile or only affects photosynthesis.

It is applicable to the measurement of the effects of substances deliberately added to the soil and to the comparison of soils of known and unknown quality.

The method is not intended for use as a measure of the ability of the soil to support sustained plant growth.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 11269. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11269 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

¹⁾ To be published.

ISO 11274:—, *Soil quality — Determination of the water retention characteristic — Laboratory methods*¹⁾.

3 Principle

Growth of pregerminated seeds under controlled conditions for a set period depending on the test plant being used. The two control media are sand and soil. After the growth period, measurement of the root lengths from both of the controls and the unknown soil or substance under test. Statistically significant differences in the root lengths of seedlings grown in any test medium compared to the controls is indicative of an effect.

NOTE 1 Shoot length is also a useful parameter, and this can be measured in conjunction with root length to provide additional or corroborative data.

4 Test plants and materials

4.1 Plants

The test plant shall be grown from undressed seeds.

NOTE 2 Barley (*Hordeum vulgare* L.) of the variety “CV Triumph” has been used for several years and is currently recommended. However, other barley varieties (undressed) will suffice, providing they have similar qualities of germination and root elongation.

NOTE 3 the methodology of this test can also be adapted for use with dicotyledonous species with straight roots which are easily measurable.

4.2 Pots

The pots shall be cylindrical, approximately 8 cm in diameter and 11 cm in height, and shall have parallel sides to ensure that the roots of seedlings are not restricted and do not encounter tapering side walls. The base of the pots shall be perforated and covered with filter paper if necessary.

NOTE 4 When filled to a height of 10 cm, the pots will contain approximately 500 g of air-dry soil.

4.3 Growth media

The growth media are the test soil, a control soil that is known to be of good quality and a sand control.

The sand control medium is washed industrial sand or other similar pure sand of the following particle size distribution: 10 % > 0,6 mm, 80 % between 0,2 mm and 0,6 mm, 10 % < 0,2 mm.

NOTE 5 The control soil and test soil should be of the same textural class, and be as similar as practicable in all respects other than the presence of the chemical or contaminant being investigated.