SLOVENSKI STANDARD
SIST EN 16086-2:2012

01-marec-2012

Izboljševalci tal in rastni substrati - Določevanje sprejemljivosti za rastline - 2. del: Preskus v petrijevki s krešo

Soil improvers and growing media - Determination of plant response - Part 2: Petri dish test using cress

Bodenverbesserungsmittel und Kultursubstrate - Bestimmung der Pflanzenverträglichkeit - Teil 2: Petrischalentest mit Kresse

Amendements au sol et supports de culture - Détermination de la réponse des plantes - Partie 2: Essai en boîte de Petri avec du cresson

Ta slovenski standard je istoveten z: **EN 16086-2:2011**

ICS:

65.080	Gnojila	Fertilizers

SIST EN 16086-2:2012 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16086-2

November 2011

ICS 65.080

English Version

Soil improvers and growing media - Determination of plant response - Part 2: Petri dish test using cress

Amendements du sol et supports de culture - Détermination de la réponse des plantes - Partie 2: Essai en boîte de Pétri avec du cresson

Bodenverbesserungsmittel und Kultursubstrate - Bestimmung der Pflanzenverträglichkeit - Teil 2: Petrischalentest mit Kresse

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 16086-2:2011: E

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Foreword

This document has been prepared by Technical Committee CEN/TC "Soil improvers and growing media", the secretariat of which is held by ASI.

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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.

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1 Scope

This European Standard describes a method for the routine determination of the effect of soil improvers and growing media or constituents thereof on the germination and early root development of cress.

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.

EN 13037, *Soil improvers and growing media – Determination of pH*

EN 13038, *Soil improvers and growing media – Determination of electrical conductivity*

EN 13040, *Soil improvers and growing media – Sample preparation for chemical and physical tests, determination of dry matter content, moisture content and laboratory compacted bulk density*

EN ISO 3696, *Water for analytical laboratory use – Specification and test methods (ISO 3696:1987)*

3 Terms and definitions

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

3.1
plant response
variation in cress seed germination and/or growth when sown and grown in a growing medium, soil improver or constituent thereof

NOTE Factors causing negative plant growth cannot be identified nor sufficiently quantified by applying this method.

3.2
germination
for this method, the seed is said to have germinated as soon as the radicle has emerged from the seed

3.3
root length index
percentage difference of the root length of germinated cress seeds on the material under investigation compared to the root length of the control

3.4
Munoo-Liisa Vitality index
index calculated from the germination rate and the root length

4 Principle

Cress seeds are exposed to the test material for a few days under controlled conditions. The germination and growth of young roots are measured and compared with a control sample.

The inhibition of germination and growth of young roots may be caused by phytotoxic substances. If the electrical conductivity (EC) in the diluted material is greater than 80 mS m^{-1} according to EN 13038, the sample is diluted with sphagnum peat. In this case, the test does not measure the adverse effect of high EC of materials on germination and root development.

NOTE 1 In the case of composted materials, these phytotoxic substances can be for instance ammonia, ethylene oxide or short chain fatty acids.

NOTE 2 The test can also be used as an indication of the instability and “immaturity” of the material.

If required (for example to fulfil certain quality certification requirements or legislation), materials can be tested without checking the EC.

For testing of specific effects, the use of additional plant species such as Chinese cabbage or lettuce may be considered.

5 Choice of methodology

5.1 Contact method

For most of growing media or soil improvers, the petri dish test can be carried out with the seeds in physical contact with the material to be tested.

5.2 Extract method

Coarse samples such as bark, expanded clay, lava, mineral wool, perlite, polyurethane and pumice, used at 100 % as a growing medium, are not suitable for this procedure. For these materials, the seeds should be in contact with a filter paper thoroughly wetted with an extract of the material to be tested.

6 Material

6.1 Cress seeds (Lepidium sativum)

Germination capacity ≥ 95 %.

6.2 Water of class 3

According to EN ISO 3696.

6.3 Sphagnum peat

Sphagnum peat with a degree of humification H3 – H5 according to von Post scale, a pH between 3,0 and 4,5 (measured according to EN 13037), an EC of between 1 and 5 mS m^{-1} (measured according to EN 13038) and a particle size < 10 mm; without pH-adjustment or fertilizer addition.

6.4 Fertilized and limed Sphagnum peat

Sphagnum peat (see 6.3), pH-adjusted using ground limestone to a range between 5,5 and 6,5 measured according to EN 13037, fertilized with a water soluble complete fertilizer with essential micronutrients, supplying (225 ± 25) mg $N \cdot l^{-1}$ (for example 1,5 g $\cdot l^{-1}$ water soluble complete fertilizer N : P_2O_5 : K_2O - 15 : 10 : 20).

NOTE See Annex B.2.

6.5 Petri dishes

Square, nominal 100 mm length and width, nominal 18 mm height.

6.6 Perlite

Particle size < 2,5 mm, maximum 20 % *W/W* < 0,5 mm.

6.7 Testing facility

Temperature controlled room or growth chamber which can be set at (25 ± 5) °C.

6.8 Sieve with 10 mm mesh size

6.9 Filter paper

Approximately 1,42 mm thickness, approximately 700g/m^2 weight (for example Whatman “blotter light blue 3644” or equivalent product).

6.10 Ground limestone

Finely ground limestone, containing at least 5 % $MgCO_3$, having a particle size less than 1 mm and a moisture content of less than 1 % m/m.

7 Contact method

7.1 General preparation

Pass the sample through a 10 mm sieve (see 6.8). Any foreign material such as plastic, metal or glass retained on the sieve shall be removed, the percentage shall be noted. Any other material retained on the sieve which is an intrinsic part of the sample shall be physically reduced to parts of similar size as few times as are necessary to permit the entire sample to pass through the sieve. Fibrous materials i.e. coir fibres and straw shall be cut to a length ≤ 10 mm by using scissors. Thoroughly mix the laboratory sample with the broken particles retained on the sieve taking care to minimise physical damage to the sample as a whole. Transportation and possible storage of the samples shall be done in accordance with EN 13040, using food grade polyethylene bags.

NOTE In cases where the proportion of the retained material is above 30 % weight, the extract method is more appropriate.

7.2 Sample storage and preparation

If necessary, samples can be stored according to EN 13040. The material to be tested shall be moistened to the approximate optimum moisture content according to the fist test (see Annex B).

The electrical conductivity of the moistened test sample shall be determined according to EN 13038. If the EC of the sample is > 80 mS m^{-1}, the sample shall be diluted with a sufficient amount of sphagnum peat (see 6.3) until the EC does not exceed 80 mS m^{-1}. The pH according to EN 13037 is ideally within the range between 5,5 and 6,5. If it is below, the pH shall be adjusted by adding limestone (see 6.10). After adding limestone, the sample shall be equilibrated for 24 h.

NOTE Usually, 2 g to 3 g of limestone per litre should be sufficient.

If required (for example to fulfil certain quality certification requirements or legislation), materials can be tested without checking the EC.

7.3 Procedure

Fill the petri dish completely and level the surface (for example with a spatula) without heavy compression. Where the seed is being placed, remove any particles > 5 mm. Sow 10 cress seeds per dish evenly spaced on the test material 10 mm to 20 mm from the top and press the seed gently into the surface of the test material. It is important that there is good contact with the test material. To ensure this, a drop of water shall be added to each seed using a pipette. Perform the procedure in at least three replicates.

NOTE 1 A higher number of replicates can be used. The number of replicates should be taken into account for the calculation of the results.

As a control sample, perform the same procedure with limed and fertilized sphagnum peat (see 6.4), in three replicates.

NOTE 2 As a “positive” reference, the procedure can be performed using fertilized Sphagnum peat (see 6.4) wetted with a solution of acetic acid resulting in a final concentration of approximately 350 mg acetic acid per litre of sphagnum peat. This should give a reduction of the germination rate and/or the root length of about 50 %.

Close the dishes with their covers and incubate with the Petri dish placed 70°to 80° to the horizontal with the end where the seeds are placed uppermost and with the substrate on the lower surface in the dark at (25 ± 5) °C (see Figure 1). Incubate as described for 72 h. Determine the percentage germination (germination rate) root development (root score) by measuring the length in mm. If the average germination rate (see 7.4) in the reference material is below 85 %, the test is invalid.

NOTE 3 The covers can be fixed by using a rubber band or wrapping them in aluminium foil. If the Petri dish is completely covered by the foil, it can be incubated without additional darkening.

NOTE 4 A digital photograph can be taken and an image analysis can be prepared using an image analysis programme. This will give root length and root diameter and the results can be reported as percentage of control.