SLOVENSKI STANDARD
SIST EN 17703:2025

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Nadomešča:
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Rastlinski biostimulanti - Določanje kroma Cr(VI)

Plant biostimulants - Determination of chromium(VI)

Pflanzen-Biostimulanzien - Bestimmung von Chrom(VI)

Biostimulants des végétaux - Dosage du chrome(VI)

Ta slovenski standard je istoveten z: **EN 17703:2024**

ICS:

65.080	Gnojila	Fertilizers

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EUROPEAN STANDARD
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English Version

Plant biostimulants - Determination of chromium(VI)

Biostimulants des végétaux - Dosage du chrome(VI)

Pflanzen-Biostimulanzien - Bestimmung von Chrom(VI)

This European Standard was approved by CEN on 26 August 2024.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 17703:2024) has been prepared by Technical Committee CEN/TC 455 “Plant Biostimulants”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2025, and conflicting national standards shall be withdrawn at the latest by May 2025.

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

This document supersedes CEN TS 17703:2022.

In comparison with the previous edition no significant technical changes were applied in this document.

The following main editorial changes have been made:

— In the Introduction, standards used as basis for the document and the description of Annexes A, B and C were added;

— In the Scope (Clause 1), the applicability of the document to blends was added;

— The Normative references (Clause 2) and the Bibliography were reordered. Clause 2 only contains the references that some or all of their content constitute requirements of this document, while the other references were included in the Bibliography;

— The principle (Clause 4) was better clarified;

— In Clause 8, the calculation and the expression of the results were aligned to EN 17704:2024 for the dry matter expression;

— In the test report (Clause 9) further information was added;

— Annex A on the results of the inter-laboratory study was added and consequently Annex A (Chromatographic conditions for direct detection method) and Annex B (Chromatographic conditions for method with post-column reaction) became Annex B and C respectively;

— In Annex B and Annex C, two examples of chromatograms were added;

— Annex ZA for the relationship with EU Legislation was added;

— In the text, if references were superseded, the latest edition has been mentioned.

This document has been prepared under a Standardization Request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

The European Committee for Standardization (CEN) was requested by the European Commission (EC) to draft European Standards or European Standardization deliverables to support the implementation of Regulation (EU) 2019/1009 of 5 June 2019 [1] laying down rules on the making available on the market of EU fertilising products ("FPR" or "Fertilising Products Regulation").

This standardization request, presented as SR M/564 and relevant amendments, also contributes to the Communication on "Innovating for Sustainable Growth: A Bio economy for Europe". The interest in plant biostimulants has increased significantly in Europe as a valuable tool to use in agriculture. Standardization was identified as having an important role in order to promote the use of biostimulants. The work of CEN/TC 455 seeks to improve the reliability of the supply chain, thereby improving the confidence of farmers, industry, and consumers in biostimulants, and will promote and support commercialisation of the European biostimulant industry.

This document provides the method for the chromium VI extraction and determination as mentioned in Annex I, Part II, PFC 6, item 2(b) of Regulation (EU) 2019/1009 [1].

Standards for determination of chromium VI in soil and waste [2] and for leather [3] were studied and considered as a basis of this document.

This document contains two annexes (B and C) which describe two possible ways for determining chromium VI by ion chromatography. Annex B describes an example of chromatographic conditions for the direct detection method, while Annex C explains the chromatographic conditions for method with post-column reaction. Both methods can be applied to determine Chromium VI. The choice depends on the equipment available in laboratories.

The inter-laboratory study reflects the final statistical characteristics of the method for the determination of chromium VI content in plant biostimulants. The results are given in Annex A (informative).

WARNING — Persons using this document should be familiar with usual laboratory practice. This document does not purport to address all of the safety issues, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted according to this document are carried out by suitably trained staff.

1 Scope

This document specifies a method for verifying that hexavalent chromium (Cr(VI)) is not present in plant biostimulants.

This document is applicable to all types of plant biostimulants (solid and liquid) used in agriculture.

The method specified is suitable to quantify the chromium(VI) content in plant biostimulants down to 2 mg/kg.

The results obtained from this method are strictly dependent on the extraction conditions. Results obtained by using other extraction procedures (extraction solution, pH, extraction time, etc.) are not comparable with the results produced by the procedure specified in this document.

This document is applicable to the blends of fertilizing products where a blend is a mix of at least two of the following component EU fertilising products: Fertilizers, Liming Materials, Soil Improvers, Growing Media, Inhibitors, Plant Biostimulants and where the following category Plant Biostimulants is the highest percentage in the blend by mass or volume, or in the case of liquid form by dry mass. If Plant Biostimulants is not the highest percentage in the blend, the European Standard for the highest percentage of the blend applies. In case a blend of fertilizing products is composed of components in equal quantity or in case the component EU fertilising products used for the blend have identical formulations[1], the user decides which standard to apply.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 17702-1:2024, *Plant biostimulants — Sampling and sample preparation — Part 1: Sampling*

EN 17702-2:2024 *Plant biostimulants — Sampling and sample preparation — Part 2: Sample preparation*

EN 17704:2024, *Plant biostimulants — Determination of dry matter*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org

[1] An example of such a blend is a product with 2 claimed functions consisting of a non-microbial plant biostimulant and an organic fertilizer composed of 1 kg/kg of plant biostimulant from seaweed.

3.1
chromium(VI) content
amount of chromium(VI) in plant biostimulant determined after extraction with an aqueous salt solution at pH 7,0 to 8,0

Note 1 to entry: The chromium(VI) content is reported as chromium(VI) in milligrams per kilogram (mg/kg), expressed as the dry mass of the sample.

[SOURCE: EN ISO 17075-2:2017, 3.1 [3], modified — "leather" was replaced by "plant biostimulants"]

4 Principle

To prove the compliance with the limit value for chromium(VI) in plant biostimulants, there is the possibility to choose between:

— Using a testing method determining the total chromium content, as long as the result of the test shows a content below the limit value for chromium(VI). In such a case, it can be safely assumed that the plant biostimulant complies with the limit value for chromium (VI); or

— Using a testing method which determines only chromium(VI) content.

The determination of the total chromium in plant biostimulants can be performed by aqua regia digestion (EN 17701-1:2024, [4]) and ICP-AES determination (EN 17701-2:2024, [5]).

This standard specifies the procedure to determine directly the content of chromium (VI) in plant biostimulants: extractable chromium(VI) is leached from the sample in phosphate buffer at pH 7,0 to 8,0. An aliquot of the filtered extract is analysed for Cr(VI) using ion-exchange chromatography with UV-VIS detection.

5 Chemicals

All reagents used shall have at least analytical grade purity.

5.1 Extraction solution

Dissolve 22,8 g of dipotassium hydrogenphosphate trihydrate ($K_2HPO_4 \cdot 3H_2O$) in 1 000 ml water (5.7), adjusted to pH 8,0 ± 0,1 with phosphoric acid solution (5.2). Degas this solution with either argon or nitrogen (5.6) or ultrasonic bath.

Standard practice is to make up a fresh solution each day. However, the solution can be kept for up to one week in a refrigerator at (4 ± 3) °C but shall be warmed to room temperature and degassed prior to use.

5.2 Phosphoric acid solution

700 ml *o*-phosphoric acid, ρ = 1,71 g/ml, made up to 1 000 ml with water (5.7).

First add approximately 200 ml of water (5.7) to a 1 000 ml volumetric flask, then add the 700 ml of *o*-phosphoric acid and dilute to the mark with water (5.7).

5.3 Potassium dichromate ($K_2Cr_2O_7$), dried for (16 ± 2) h at (105 ± 5) °C.

5.4 Chromium(VI) stock solution

Dissolve 2,829 g potassium dichromate ($K_2Cr_2O_7$) (5.3) in water (5.7) in a volumetric flask and make up to 1 000 ml with water (5.7). One ml of this solution contains 1 mg of chromium.

The solution can be kept for up to 12 months in a refrigerator at (4 ± 3) °C but shall be warmed to room temperature prior to use.

It is also possible to use a commercial standard solution with a certified Cr(VI) concentration that can be connected to national standards. Observe the expiry date or recommended shelf life stated by the manufacturer.

5.5 Chromium(VI) standard solution

Pipette 1 ml of solution (5.4) into a 1 000 ml volumetric flask and make up to the mark with extraction solution (5.1). One ml of this solution contains 1 µg of chromium.

The solution can be kept for up to one week in a refrigerator at (4 ± 3) °C but shall be warmed to room temperature prior to use.

A stock solution of hexavalent chromium at this concentration level is an alternative available commercially.

5.6 Argon or nitrogen, oxygen-free

Preference should be given to argon as an inert gas instead of nitrogen because argon has a higher specific mass than air.

5.7 Distilled or deionised water, with a specific conductivity not higher than 0,2 mS/m at 25 °C.

5.8 Magnesium chloride hexahydrate ($MgCl_2 \cdot 6H_2O$)

Dissolve 85,4 g of magnesium chloride hexahydrate ($MgCl_2 \cdot 6H_2O$) in a 100 ml volumetric flask, dilute with water (5.7), close and mix thoroughly.

6 Apparatus and materials

Usual laboratory equipment and, in particular, the following.

6.1 Suitable mechanical orbital shaker, (100 ± 10) min^{-1}.

6.2 Conical flask, of capacity 250 ml, with stopper.

6.3 Aeration tube and flow meter, suitable for a flow rate of (50 ± 10) ml/min.

6.4 pH meter, with glass electrode.

6.5 Membrane filter, 0,45 µm pore size [polytetrafluoroethylene (PTFE) or polyamide 66].

6.6 Common laboratory glassware and pipettes.

6.7 Vacuum device, suitable for filtration of extraction solution, mobile phase, and sample extracts.

6.8 Ion-exchange chromatograph, with UV or visible detector or high performance liquid chromatography (HPLC) with anion-exchange column and UV or visible detector. A photo diode array detector (DAD) is recommended.

6.9 Analytical balance, capable of weighing to 0,1 mg.

6.10 Syringe membrane filters, of polyamide 6.6 of 0,45 µm for filtration of standards.

6.11 Suitable vials for Ionic Chromatography (IC) or HPLC.