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BSI Standards Publication

Plant biostimulants — Determination of phosphonates

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National foreword

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European foreword

This document (CEN/TS 17705:2022) has been prepared by the Technical Committee CEN/TC 455 “Plant biostimulants”, the secretariat of which is held by AFNOR.

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 has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

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.

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Introduction

This document was prepared by the experts of CEN/TC 455 “Plant Biostimulants”. 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 laying down rules on the making available on the market of EU fertilizing products (“FPR” or “Fertilising Products Regulation”).

This standardization request, presented as M/564, also contributes to the Communication on “Innovating for Sustainable Growth: A Bio economy for Europe”. The Working Group 4 “Other safety parameters”, was created to develop a work program as part of this request. The technical committee CEN/TC 455 “Plant Biostimulants” was established to carry out the work program that will prepare a series of standards. The interest in 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.

The preparation of this document is based on the Fertilising Products Standardization Request (M/564) to CEN by the European Commission and the European Free Trade Association concerning a development of the methods for analysis of fertilizers in the framework of Regulation (EC) No 2019/1009.

This document describes the extraction and measurement for the determination of phosphonate (phosphite) in plant biostimulants. It is based on a water extraction of the phosphonate (phosphite) followed by ion chromatography with conductivity detection (IC-CD).

The ion chromatography with a conductivity detector (IC-CD) method can be used in well-equipped analytical laboratories for the determination of different ions. In the field of fertilizing products, the method is used and standardized for the determination of perchlorates in mineral fertilizers. The IC-CD method can determine more ions simultaneously.

The legislative limit for phosphonate content is 0,5 % (mass fraction) and the method described in this document was adapted to achieve this requirement and simultaneously to reduce interferences from other co-extracted anions as much as possible.

The definition of phosphonates is not clearly stated in the Regulation 2019/1009 and to avoid any misunderstanding the results are expressed as a content of phosphorus (P) bound in the form of free water-soluble phosphonates (P-PO3).

1 Scope

This document specifies a method for the extraction and determination of phosphonates ($P–PO_3$) in plant biostimulants using ion chromatography and conductivity detection (IC-CD).

This document is also applicable to the blends of fertilizing products where plant biostimulants are the main part of the blend. Otherwise, the Technical Specification for the main part of the blend applies.

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.

CEN/TS 17704, *Plant biostimulants — Determination of dry matter*

3 Terms and definitions

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

3.1
phosphonates
salts derived from phosphonic acid (H_3PO_3)

4 Principle

A representative test portion of the sample is extracted with water. Phosphonate in the extract is selectively separated from other compounds using ion chromatography (IC) and determined by a conductivity detector (CD). External calibration is used for quantification of the amount of the phosphonate.

5 Reagents

All reagents shall be of recognized analytical grade. The concentration of phosphonate in the reagents and deionized water used shall be low enough not to affect the results of the determination.

5.1 Water with a specific conductivity not higher than 0,2 mS/m at 25 °C.

5.2 Phosphonate standard stock solution r(P-PO3) = 1 000 mg/l is prepared by dissolving commercially available sodium phosphite dibasic pentahydrate salt (Mw = 216,04 mol/l, purity ≥ 98 %). For preparation the phosphonate standard stock solution 0,697 ± 0,001 g is weighed, transferred to 100 ml volumetric flask, fill with deionized water (5.1) to final volume and mix thoroughly.

5.3 Phosphonate standard solution, r(P-PO3) = 100 mg/l is prepared from a standard stock solution (5.2) by appropriate dilution with deionized water (5.1). Pipette 10 ml of stock solution (5.2) to a 100ml volumetric flask, fill with deionized water (5.1) to final volume and mix thoroughly.

5.4 Mobile phase, KOH cartridge for ion chromatography (commercially supplied). Concentration of the KOH mobile phase is electrolytically generated in externally supplied deionized water (5.1).

Different mobile phase may be used according to the instructions of the manufacturer of the column.

5.5 Chloride standard $r(Cl^-)$ = 1 000 mg/l - commercially available.

5.6 Nitrate standard $r(NO3^-)$ = 1 000 mg/l – commercially available.