SLOVENSKI STANDARD
kSIST-TS FprCEN/TS 17721:2021

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Rastlinski biostimulansi - Določevanje pH

Plant biostimulants - Determination of the pH for liquid microbial plant biostimulants/pH in microbial products - Determination of pH

Biostimulanzien für die pflanzliche Anwendung - Bestimmung des pH-Wertes für flüssige mikrobielle Biostimulanzien für die pflanzliche Anwendung/pH-Wert in mikrobiellen Produkten - Bestimmung des pH-Wertes

Ta slovenski standard je istoveten z: FprCEN/TS 17721

ICS:

65.080	Gnojila	Fertilizers

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TECHNICAL SPECIFICATION

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FINAL DRAFT
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ICS 65.080

English Version

Plant biostimulants - Determination of the pH for liquid microbial plant biostimulants/pH in microbial products - Determination of pH

Biostimulanzien für die pflanzliche Anwendung - Bestimmung des pH-Wertes für flüssige mikrobielle Biostimulanzien für die pflanzliche Anwendung/pH-Wert in mikrobiellen Produkten - Bestimmung des pH-Wertes

This draft Technical Specification is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/TC 455.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a Technical Specification. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a Technical Specification.

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

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Contents

Page

European foreword

This document (FprCEN/TS 17721:2021) has been prepared by Technical Committee CEN/TC 455 “Plant Biostimulants”, the secretariat of which is held by AFNOR.

This document is currently submitted to the Vote on TS.

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

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 fertilising products ("FPR" or "Fertilising Products Regulation"). This request, presented as SR M/564, also contributes to the Communication on "Innovating for Sustainable Growth: A Bio economy for Europe". The Working Group 5 "Labelling and denominations", 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.

Liquid microbial plant biostimulant have a pH optimal for contained microorganisms and for plants [1].

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

IMPORTANT — It is absolutely essential that tests conducted in accordance with this document be carried out by suitably trained staff.

1 Scope

This document specifies a method for laboratory measurement of the pH value in liquid microbial plant biostimulants, using pH electrodes with a glass membrane.

From the scope of this document plant biostimulants other than microbial Plant Biostimulants are excluded because there is no essential requirement in the Regulation [1] for measuring the pH of non-microbial Plant Biostimulants.

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.

FprCEN/TS 17702-1, *Plant biostimulants – Sampling and sample preparation – Part 1: Sampling*

FprCEN/TS 17702-2, *Plant biostimulants – Sampling and sample preparation – Part 2: Sample preparation*

FprCEN/TS 17724, *Plant Biostimulants – Terminology*

EN ISO 3696:1995, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in FprCEN/TS 17724 and the following apply.

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
pH
measure for the acidic or basic reaction of an aqueous solution or dispersion

Note 1 to entry: Notation of pH: the p and the H are vertically on one line.

Note 2 to entry: The acidic reaction is determined by the activity of the existing “hydrogen ions”. The basic reaction is determined by the activity of the existing hydroxide ions. The direct relationship between the activities of the “hydrogen ions” and the hydroxide ions is described by the ionic product of the water.

3.2
pH value
decadal logarithm of the hydrogen ion activity multiplied with (−1)

$$pH = pa_{H+} = -lg\left(\frac{a_{H+}}{m^0}\right) = -lg\left(\frac{m_{H+} \cdot \gamma_{m,H+}}{m^0}\right)$$

with

$$a_{H+} = m_{H+} \cdot \gamma_{m,H+}$$

where

a_{H+}	is the activity of the hydrogen ion, expressed in mole per kilogram (mol/kg);
m^0	is the standard molality expressed in mole per kilogram (mol/kg);
$\gamma_{m, H+}$	is the activity coefficient of the hydrogen ion;
m_{H+}	is the molality of the hydrogen ion, expressed in mole per kilogram (mol/kg).

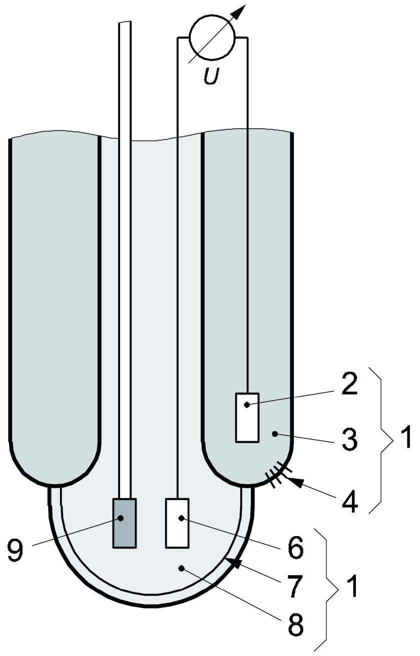
Note 1 to entry: The pH value is not measureable as a measure of a single ion activity. Therefore, pH(PS) values of solutions of primary reference material (PS, en: Primary Standard) are determined, which are approximate to it and can be attributed to it. This is based on a worldwide agreement; see EN ISO 80000-9:2019, Annex C [2].

3.3
potentiometric measuring chain
combination of electrochemical half cells

3.4
pH (combination) electrode
pH (single-rod) measuring chain
potentiometric measuring chain (3.3) providing a voltage which depends on the *pH value* (3.2) of the measuring solution

Note 1 to entry: One of the two electrochemical half cells is the pH measuring electrode, the second is a *reference electrode* (3.5) (see Figure 1).

Note 2 to entry: An integrated temperature sensor is recommended (see Figure 1).



Key

1	reference electrode, consisting in 2, 3 and 4
2	reference element
3	reference electrolyte
4	diaphragm
5	pH measuring electrode, consisting of 6, 7 and 8
6	reference element
7	glass memebrane
8	internal buffer
9	temperature sensor
U	pH proportional voltage

Figure 1 — Design of a pH electrode with glass membrane and temperature sensor (schematic illustration)

Note 3 to entry: This document refers to pH electrodes with glass membranes. The electrode shaft should be made of material resistant to chemicals and solvents.

3.5
reference electrode
electrode providing a constant potential which is independent from the pH value (3.2) of the measuring medium

Note 1 to entry: At present, the most commonly used type is the silver/silver chloride reference electrode, whose potential is stabilized by a constant concentration of potassium chloride (KCl) in the *reference electrolyte* (3.7).

3.6
reference element
galvanic cell which dips into the *reference electrolyte* (3.7) and transmits the reference potential to the pH meter

Note 1 to entry: The reference elements of the pH measuring electrode and of the reference electrode should be aligned so that identical temperature characteristics are given.

3.7
reference electrolyte
aqueous salt solution (generally potassium chloride solution), whose chloride ion activity determines the potential of the *reference electrode* (3.5)

Note 1 to entry: At the *diaphragm* (3.8), the reference electrolyte has contact with the measuring solution. Potassium chloride solution is used as reference electrolyte, because K^+ ions and Cl^- ions have almost the same ion mobility and, therefore, only slight diffusion potential result.

Note 2 to entry: The reference electrolyte should flow out of the diaphragm in order to ensure a constant reference potential. Therefore, it shall be refilled occasionally. For *reference electrodes* (3.5) or *pH electrodes* (3.4) with thickened/gel or solidified electrolyte, refilling of the electrolyte can be omitted. Such reference electrodes or pH electrodes are called low-maintenance.

3.8
diaphragm
permeable material in the sides of the casing of *reference electrodes* (3.5), which enables the electrolytic contact between *reference electrolytes* (3.7) and measuring solution and simultaneously impedes the exchange of electrolyte

3.9
measuring electrode with glass membrane
electrode providing a potential which is a function of the *pH value* (3.2)

3.10
pH glass membrane
membrane made of special glass, on whose interface to the solution an electrical potential (electrode function) results, which is proportional to the *pH* (3.1) of the solution

3.11
temperature compensation
compensation of the temperature-dependent measuring signal only of the *buffer solutions* (3.15) with known temperature dependency

Note 1 to entry: By this, the temperature dependency of the *pH value* (3.2) of the measuring medium cannot be compensated. Therefore, the temperature is always recorded together with the pH value.

3.12
theoretical slope
k
change of the voltage of the *pH electrode* (3.4) with temperature

$$k = -\frac{R \cdot T}{F} \ln 10 = -2,303 \cdot \frac{R \cdot T}{F}$$

where

T	is the thermodynamic temperature, in Kelvin (measuring temperature, in ° C + 273,15 ° C);
R	is the gas constant 8,314 $\mathrm{Jmol^{-1}K^{-1}}$;
F	is the Farady constant 96 485 $\mathrm{Cmol^{-1}}$.

Note 1 to entry: At 23°C, k = −58,57 mV.