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Rastlinski biostimulanti - Navedbe - 3. del: Toleranca na abiotični stres pri rastlinah zaradi uporabe biostimulanta

Plant biostimulants - Claims - Part 3: Tolerance to abiotic stress resulting from the use of a plant biostimulan

Pflanzen-Biostimulanzien - Auslobungen - Teil 3: Toleranz gegenüber abiotischem Stress infolge der Verwendung eines Pflanzen-Biostimulans

Biostimulants des végétaux - Allégations - Partie 3 : Tolérance au stress abiotique résultant de l'utilisation d'un biostimulant des végétaux

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65.080	Gnojila	Fertilizers

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English Version

Plant biostimulants - Claims - Part 3: Tolerance to abiotic stress resulting from the use of a plant biostimulant

Biostimulants des végétaux - Allégations - Partie 3 : Tolérance au stress abiotique résultant de l'utilisation d'un biostimulant des végétaux

Pflanzen-Biostimulanzien - Auslobungen - Teil 3: Toleranz gegenüber abiotischem Stress infolge der Verwendung eines Pflanzen-Biostimulans

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

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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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.

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

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European foreword

This document (prEN 17700-3:2023) 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 CEN Enquiry.

This document will supersede CEN/TS 17700-3:2022.

prEN 17700-3:2023 includes the following significant technical changes with respect to CEN/TS 17700-3:2022:

— Addition of some definitions;

— Addition of a flowchart diagram explaining the rationale for trial designs in Annex A.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

The EN 17700 series, *Plant biostimulants — Claims*, consists of the following parts:

— *Part 1:General principles*;

— *Part 2: Nutrient use efficiency resulting from the use of a plant biostimulant*;

— *Part 3: Tolerance to abiotic stress resulting from the use of a plant biostimulant*;

— *Part 4: Determination of quality traits, resulting from the use of a plant biostimulant*;

— *Part 5: Determination of availability of confined nutrients in the soil or rhizosphere*.

Introduction

This document has been developed to provide guidance for a consistent approach to justify the claims associated with the use of plant biostimulants in agriculture.

The definition of plant biostimulants to be used in the regulation on fertilizing materials is claims-based. For this reason, demonstrating that a product is indeed a *bona fide* plant biostimulant depends on a demonstration of its effect.

The placing of a plant biostimulant on the market should not be considered to guarantee effectiveness under all conditions, as many factors may influence the performance of a plant biostimulant in the field.

Plant biostimulants used in agriculture can be applied in multiple ways: on soil, on plant, as seed treatment, etc. This document is applicable to all application types of plant biostimulants in agriculture.

1 Scope

This document provides guidance for justifying abiotic stress tolerance claim of plant biostimulants used in agriculture.

This document is aimed primarily at manufacturers, laboratories, companies which will put the products on the market, notifying authorities, notified bodies, and market surveillance authorities.

To be in compliance with this standard, it is important also to follow the Recommendations and Quality Criteria described in the Standard of General Principles EN 17700-1:—[1].

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 17700-1:—[1], *Plant biostimulants — Claims — Part 1: General principles*

EN 17724:—[2], *Plant biostimulants — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17700-1:—[1], EN 17724:—[2], and the following 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/

3.1
tolerance to abiotic stress
ability to endure abiotic stress

3.2
agronomic marker
measurable plant trait used to validate the claim

EXAMPLE Refer to Clause 6 of this document.

3.3
stress marker
physiological, biochemical and molecular traits associated with a plant response to a specific stress

EXAMPLE Heat shock proteins, electrolyte leakage for thermal stress, chlorophyll fluorescence, lipid peroxidation for light stress, electrolyte leakage, lipid peroxidation for mechanical stress, relative water content, electrolyte leakage for water stress.

[1] Under preparation
[2] Under preparation

3.4
abiotic stress
negative impact of non-living factors on the plant in a specific crop environment

Note 1 to entry: Crop tolerance to abiotic stress is addressed to one or more (multiple or combined) of the following stress categories:

1) thermal stress,

2) light stress,

3) mechanical stress,

4) water stress,

5) chemical stress.

3.5
thermal stress
negative impact of temperature (supra-optimal and sub-optimal temperature) on the plant in a specific crop environment

EXAMPLE heat stress or cold stress such as chilling and freezing stress

3.6
light stress
negative impact of light intensity and/or spectrum on the plant in a specific crop environment

EXAMPLE high irradiance or low irradiance, UV radiation

3.7
mechanical stress
negative impact of a mechanical force on the plant or the root zone in a specific crop environment

EXAMPLE wind, hail, agricultural operations

3.8
water stress
negative impact of water or high solutes concentrations or excessive transpiration on the plant in a specific crop environment

EXAMPLE drought, high air vapour pressure deficit, flooding

3.9
chemical stress
negative impact of chemicals (supra-optimal or sub-optimal chemical compounds or presence) on the plant in a specific crop environment

EXAMPLE salt stress, mineral toxicity induced by heavy metals or excessive application of mineral nutrients, adverse pH conditions, ozone stress, phytotoxic effects of xenobiotics

3.10
xenobiotic
chemical substance found within an organism that is not naturally produced or expected to be present within the organism

EXAMPLE heavy metals, ozone

4 Terminology of the claim

The type of claim(s) included in the European Standard can be addressed to one or more of the above defined abiotic stress(es) (see 3.5 to 3.7).

For instance, a plant biostimulant can improve plant tolerance to a single abiotic stress factor such as heat stress or to multiple abiotic stress factors such as heat stress and salt stress in one or more target crop(s).

Label shall clearly indicate that the plant biostimulant is addressed to improve tolerance to abiotic stress with a clear indication of the type of abiotic stress(es) and the crop(s) on which the effect is demonstrated according to EN 17700-1:—[1].

EXAMPLE "improves tolerance to drought stress on woody perennials", "improves tolerance to cold stress on tomato"

5 Justification of plant biostimulant claims regarding abiotic stress tolerance

5.1 Introduction

In open field conditions it can be difficult to fully control specific abiotic stress factors due to their inherent variability and due to the fact, that, often several abiotic stresses may be present at the same time (combinational stresses). Therefore, to fully validate an abiotic stress tolerance claim with both a negative (untreated and unstressed) control and a positive (untreated and stressed) control, trial should take place under controlled conditions (e.g. growth chamber, greenhouse).

By contrasting and comparing negative and positive control treatments, a researcher can verify the stress experienced by the plant. Or in other words, how much damage/growth depression was caused by the stress on the plant without any biostimulant application.

In some situations, a negative control might not be easily implemented in the same growing environment. In this case, the emphasis is placed more on detecting the specific stress by assessing specific markers within the plant response to both the environment (growing conditions) and the plant biostimulant application.

In order to justify the claim, these stress markers shall be of agronomic significance (specific to the stress being examined e.g. heat shock proteins created by heat stress). Their relevance may be proved through referencing previous peer reviewed literature that correlated these markers to the stress being examined. Often this stress marker (be it physiological, biochemical or genetic) will cause a plant response (change in phenotype) which will either be promoted or reduced through the use of biostimulants.

Therefore, assessing the stress marker in both the positive control (untreated and stressed) versus the treated (product to be tested) group, will allow a researcher to assess the presence of the stress and how much of a change was caused in the plant response by applying the product, allowing trials without a negative control to validate abiotic stress tolerance.

A flowchart diagram explaining the rationale for trial designs is given in Annex A (informative).

5.2 Trial design with negative control

The trial should include at a minimum the following three treatments:

Treatment	Stress conditions	Non-stress conditions
Positive Control, untreated plant (X)	●	
Tested Product, treated plant (Y)	●	
Negative Control, untreated plant (Z)		●

In context with the above table, comparing the positive and negative controls (X vs Z) provided all other variables are held equal will demonstrate that the “abiotic stress” in question is real.

Positive Control (X) and Tested Product (Y) treatments can be compared only if the duration and intensity of abiotic stress is the same. All other factors such as genotype, cultural practices and environmental conditions beyond the selected stress factor shall be the same for all treatments.

In the case of a plant trait (i.e. plant biomass - A) that is reduced with the increase of abiotic stress level, the claim is validated for the tested product when Y_A and Z_A are significantly higher (refer to EN 17700-1:—[1], Clause 5) than X_A. It should be noted that for the validation of the claim there is no need for Y_A to be greater than Z_A even though the latter is a control; therefore, Y_A can take any value equal, lower or higher than Z_A provided that both Y_A and Z_A are significantly higher than X_A.

For a plant trait (i.e. leaf damage - B) that is increased with the increase of abiotic stress level, the claim is validated for the tested product when Y_B and Z_B are significantly lower (refer to EN 17700-1:—[1], Clause 5) than X_B. It should be noted that for the validation of the claim there is no need for Y_B to be lower than Z_B even though the latter is a control; therefore, Y_B can take any value equal, lower or higher than Z_B provided that both Y_B and Z_B are significantly lower than X_B.

5.3 Trial design without negative control

In the cases listed below where the implementation of a negative control (Z) is not possible in the same growing environment, the trial can be performed using only two treatments (modified design): an untreated stressed positive control (X) and a stressed treatment with application of tested product (Y). In these cases, the emphasis is placed more on detecting the stress in question by assessing a stress marker within the plant response to both the environment (growing conditions) and the plant biostimulant application. Often this stress marker (be it physiological, biochemical or genetic) will cause a plant response (change in phenotype) which will be promoted or reduced through the use of a plant biostimulant.

The cases where the modified design can be used are:

a) thermal stress caused by cold or heat,

b) light stress caused by high/low irradiance, or UV radiation,

c) water stress caused by high air vapour pressure deficit,

d) mechanical stress caused by wind, or hail,

e) salt stress caused by the negative impact of the increase of salt level into the soil and/or irrigation waters.