ICS 19.020
CCS A20

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/Z 43996.2-2024

Fine bubble technology - Agricultural applications - Part 2: Test method for evaluating the promotion of the germination of barley seeds

微细气泡技术 农业应用 第2部分：评价大麦种子发芽促进作用的测试方法

Issued on: April 25, 2024 **Implemented on: November 1, 2024**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is part 2 of GB /Z 43996 "Agricultural Application of Microbubble Technology": GB /Z 43996 has published the following part:

--- Part 1: Test method for evaluating the growth promotion effect of hydroponic lettuce;

--- Part 2: Test method for evaluating the germination promotion effect on barley seeds: This document is modified to adopt ISO 23016-2:2019 "Agricultural application of microbubble technology Part 2: Evaluation of barley seed germination promotion" The document type was adjusted from ISO standard to my country's national standardization guidance technical document: This document has the following structural adjustments compared to ISO 23016-2:2019:

--- Deleted 3:2, 3:3 and 3:10 of ISO 23016-2:2019, and the subsequent item numbers were moved forward: The technical differences between this document and ISO 23016-2:2019 and their reasons are as follows:

--- Changed the reference documents of the introductory words of terms and definitions, and replaced ISO 20480-1 and GB/T 41914:2 with GB/T 41914:

1 Replaced ISO 20480-2 (see Chapter 3) to adapt to my country's technical conditions;

--- The terms "seed soaking", "ultrafine bubble generation system", "growth cycle" and their definitions have been deleted (see 3:2, 3:3 and 3:12) to improve operability;

--- The definitions of the terms "reference water" and "raw water" (see 3:3, 3:4, 3:5, 3:6 of

ISO 23016-2:2019) have been changed to improve operability: Sex;

--- Adjust the A2 specification water from footnote description to clause content (see Chapter 5) to improve operability;

--- Added the option of "film covers the top of the beaker" (see 7:1) to improve operability: The following editorial changes were made to this document:

--- Changed the note of 3:2 ultra-fine bubble water;

---Conductivity unit changed to mS/m;

---In 6:2, the "ultrafine bubble generating system" constituting the ultrafine bubble generating system is changed to "micro-bubble generating system": Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Technical Committee for Standardization of Microbubble Technology (SAC/TC584): This document was drafted by: Taizhou Juna New Energy Co:, Ltd:, Shaoxing University of Arts and Sciences, Shanghai Ocean University, Nanjing Guoke Agricultural Science and Technology Development Co:, Ltd:, Ningbo Haibo Group Co:, Ltd:, Beijing University of Aeronautics and Astronautics, Tongji University, Shaoxing Science and Technology Industry Investment Co:, Ltd:, National Nanoscience Center, Jiangsu Agricultural and Animal Husbandry Science and Technology Vocational College, Shanghai Advanced Research Institute of the Chinese Academy of Sciences, Zhengzhou University of Light Industry, Southeast University, Taizhou Wuzha Village Shareholding Economic Cooperative in Zhangqiao Town, Taixing City, Shanghai Qiaojia Agricultural Products Professional Cooperative, and Poyang County Ainong Agriculture Co:, Ltd: The main drafters of this document are: Liang Qifeng, Ding Rong, Liang Hejun, Zhu Rong, Chen Guyi, Xia Shaohua, Liu Shu, Li Pan, Chen Xiaoqing, Chen Lan, Zhai Xujun, Wang Jianguo, Yuan Wenjun, Li Jixiang, Liu Nan, Xu Jingxiang, Lü Junpeng, Zhu Mengxue, Shao Yue, Wang Jianjun, Huang Shengfei, and Zhu Yinbiao:

In view of the growing application of microbubble technology in agriculture, this document has been developed to identify relevant standards in this field, with particular attention to The effect of microbubble technology on promoting germination and growth of barley seeds: The use of microbubble technology in agriculture has been shown to be beneficial for various crop production and has attracted interest from various countries: The application of chlorpyrifos in plants is very mature and is currently being expanded to other plants for seed germination and growth promotion: The standardization of microbubble technology in the industry is not only attracting attention, but is also being rapidly put into practice: This technology is expected to be rapidly developed: develop: In addition to agriculture, microbubble technology has also been successfully applied in environmental science, food, aquatic products, medicine and other fields: In this field, technical standardization is making

extensive progress: With the realization of this standardization, the recognition of microbubble technology in various countries around the world will increase in the future: Continuous improving: GB /Z 43996 "Agricultural Application of Microbubble Technology" aims to provide a general guide to the principles and It is required to be standardized and is planned to consist of four parts:

1 Scope

GB/Z 43996.2-2024 gives the companion test to Part 1, using seed germination instead of plant growth. Germination is a better-behaved endpoint than growth: it happens in days rather than weeks, it needs no light regime or nutrient solution to control, and the result is a count rather than a measurement of biomass, so the experiment can be replicated cheaply enough to have real statistical power. Barley is used because its germination behaviour is uniform and extensively documented, which means a deviation can be attributed to the treatment rather than to the seed lot. That makes this the more discriminating of the two methods for the underlying question - whether aerated water does anything at all - while Part 1 addresses whether the effect persists into growth. This part describes a test method for evaluating the effect of ultra-fine bubble water, produced by a fine bubble generating system, on the germination of barley seeds, together with the basis on which the method itself was validated. As a GB/Z it is a guiding technical document. Under ICS 19.020 and CCS A20, it is written for fine bubble equipment suppliers, agricultural research institutes and seed producers.

This document describes a test method for the effect of ultra-fine aerated water on the germination of barley seeds: The water is produced by an ultra-fine aerated water generating system: The effectiveness of the method was evaluated by measuring the germination rate of barley seeds: This document applies to tests to evaluate the effectiveness of microbubble technology on promoting germination of barley seeds in agricultural applications:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document: GB/T 41914:

1 Microbubble technology Microbubble use and measurement general rules Part 1: Terminology (GB/T 41914:1- 2022, ISO 20480-1:2017,IDT) GB/T 41914:

2 Microbubble technology - General rules for the use and measurement of microbubbles - Part 2: Classification of microbubble properties (GB/T 41914:2-2022, ISO 20480-2:2018,

MOD)

3 Terms and definitions

The terms and definitions defined in GB/T 41914:1 and GB/T 41914:2 and the following apply to this document: 3:

1 Germination Shoots of at least 1 mm in length emerge: [Source: ISO 18763:2016, 3:7, modified] 3:

2 Ultrafine bubble water Water with ultra-fine bubbles:

Note: Ultrafine bubbles are defined in GB/T 41914:1: 3:

3 Control water controlwater Sample water used for comparison with super sparkling water: 3:

4 Raw water Used in the production of fine sparkling water and as a reference water: 3:

5 Test water testwater Super sparkling water (3:2) or control water (3:3):