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**Technical report on LED artificial lighting environment for plant
growth**

植物生长LED人工光环境技术报告

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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: 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 is proposed and coordinated by the Ministry of Science and Technology of the People's Republic of China: This document was drafted by: Zhongguancun Semiconductor Lighting Joint Innovation Key Laboratory, Agricultural Environment and Sustainable Development, Chinese Academy of Agricultural Sciences Institute, Fujian Zhongke Biological Co., Ltd., Shenzhen Songsheng Electronics Co., Ltd., Hangzhou Huapu Yongming Optoelectronics Co., Ltd: Ltd:, Fujian Vocational College of Information Technology, Shenzhen Acletech Technology Co., Ltd:, Pujiang Sansi Optoelectronics Technology Co., Ltd:, Huizhou NVC Electric Technology Co., Ltd:, Nanchang Laboratory, Changzhou Green Lighting Co., Ltd:, Dongguan Vocational and Technical College, and Dongguan Polytechnic School: The main drafters of this document are: Li Tao, Xu Yuanyuan, Li Peng, Wang Zongyou, Huang Jianming, Wang Hong, Zhang Fengbin, Wen Xing, Xiong Fei, Zhang Yuqi, Wang Guangxu, Chen, Jianwen, Xia, Yu, Guo, Yong, Liu, Yang, and Zhang, Ling: Plant Growth LED Artificial Light Environment Technical Report

1 Scope

This technical report covers the artificial light environment created by LEDs for plant growth: the quantities that describe it, how they are measured, and what is known about

how plants respond to them. Vertical farming and greenhouse supplementation turned horticultural lighting from an agronomy question into an engineering one, and the two disciplines do not share units. A grower talks about micromoles at canopy level and photoperiod; a lighting engineer talks about lumens and efficacy, which describe how light looks to a human eye rather than what it does to a leaf. This document is written across that gap. Issued on 28 May 2024 by SAMR and SAC, in force from 1 December 2024, under the technical jurisdiction of the Ministry of Science and Technology. Useful to any LED manufacturer selling grow lights into China, and to any grower specifying them.

This document provides the artificial light environment elements for plant growth, photosynthesis, light-controlled growth and development, key evaluation indicators for light response, LED Requirements for artificial light sources and contents of artificial light environment lighting design elements: This document applies to work carried out by relevant stakeholders in the field of plant growth using LED artificial light:

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 32655-2016 Terms and definitions for LED lighting for plant growth

3 Terms and definitions

The terms and definitions defined in GB/T 32655-2016 apply to this document:

4 Overview

Light is one of the most important environmental factors for plant growth: It is not only the energy source for plant growth and development, but also the key to plant morphology: The energy that plants rely on for survival comes from sunlight: Photosynthesis is an important biological way for plants to capture light energy: Fixing carbon dioxide through photosynthesis to synthesize organic matter and produce oxygen is one of the decisive factors for the continuation of life on Earth: As a new type of light source, LED has the characteristics of energy saving, environmental protection, long life, and short response time, and has obvious advantages in the field of agricultural lighting: First, compared with traditional light sources, LEDs can adjust factors/parameters such as spectrum and radiation intensity according to demand; second, the heat generated by LEDs Low, can be close to the plant without causing plant tissue burns; secondly, the LED light source is small in size and is more suitable for multi-layer three-dimensional combination planting The

cultivation system helps to reduce the height of the cultivation shelves and increase the number of plants cultivated per unit space: It has attracted widespread attention and is widely used in all-artificial light plant factories and greenhouse supplementary lighting production to achieve the purpose of increasing yield and improving quality: This document focuses on the LED artificial light environment for plant growth, introduces the elements of plant growth light environment, plant photosynthesis and light-controlled growth and development As well as the light demand characteristics of plant growth, the key indicators of plant growth light response are proposed, and the effects of plant growth on LED artificial light sources are analyzed: The requirements and key elements of artificial light environment lighting design are used to guide the scientific and reasonable evaluation of LED artificial light environment for plant growth:

5 Elements of light environment for plant growth

1 Overview Plants' demand for light is mainly reflected in four aspects: spectrum, light intensity, photoperiod and light distribution, which are also called the "halo" of plant growth: Environmental factors": The light environment affects and Regulating plant growth and understanding the impact of light on plant growth are the theoretical basis for the application of artificial light sources in agricultural production: