



MULTITUDINOUS PIGMENT METER FOR MODERN CROP PRODUCTION

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Introduction

A plant's chlorophyll is responsible for absorbing light, primarily sunlight. Two types of energy-storing molecules receive the energy that is absorbed from light. The plant uses its stored energy to produce glucose, a form of sugar, from water and carbon dioxide that it has taken in from the atmosphere through photosynthesis. This is essential to comprehending the productivity and health of plants. Farmers and researchers can determine the nutritional state of plants, identify stress from pests, illnesses, or environmental factors, and optimize fertilizer use by measuring chlorophyll levels. Low levels of chlorophyll can suggest issues that need to be addressed, but high levels usually indicate robust, healthy plants. Frequent chlorophyll monitoring aids in crop management decision-making, production improvement, and the maintenance of sustainable agricultural methods. In addition to providing quantitative data that is essential for enhancing agricultural practices and furthering scientific research in plant physiology and ecology, the instrument facilitates accurate chlorophyll measurement. With the meter, battery charger, rechargeable batteries, USB connector, and other components, the kit guarantees portability for field use.

Analysis of pigments

In order to evaluate the health and stress levels of plants, this entails analyzing different pigments, including anthocyanins, carotenoids, and chlorophyll. These pigments have important functions in signaling, photosynthesis, and photoprotection. An understanding of the plant's nutritional status, reaction to external stressors, and general physiological state can be gained by analyzing their concentrations. This knowledge

is essential for farmers to make well-informed decisions regarding pest control, fertilization, and irrigation, which will ultimately increase crop output and quality. Pigment analysis aids in environmental monitoring by evaluating the condition of natural habitats, supporting conservation initiatives, and illuminating ecological dynamics. Chlorophyll, carotenoids, and other pigments in plants may be precisely measured thanks to the multi-pigment meter, which makes accurate pigment analysis easier. Enhancing agricultural productivity and ecosystem health, monitoring the environment, and optimizing agriculture are all made possible by this data.

Tracking the health of crops

This is necessary for profitable and sustainable agriculture. It includes routinely examining plants for indications of stress, nutrient deficits, illnesses, and pests. This can be accomplished in a number of ways, including as visual inspections, remote sensing technologies, and sophisticated instruments like the multi-pigment meter. It makes it easier to detect pigments like carotenoids, chlorophyll, and others precisely, giving important information about plant health and stress levels. Significant damage and loss can be avoided by taking prompt action when problems with the multi-pigment meter are identified early. Farmers can improve crop yield and quality by managing the use of resources like water, fertilizer, and pesticides based on precise pigment data. By preserving crop yield and health throughout the growing season, this method improves precision farming, lessens its negative effects on the environment, and supports sustainable agriculture.



Figure 1. Multi pigment meter

Precision farming

One tool that fits in nicely with the ideas of precision agriculture is the multi-pigment meter. It makes it possible for farmers and researchers to detect plant pigments like anthocyanins, carotenoids, and chlorophyll with precision. The multi-pigment meter facilitates informed crop management decision-making by offering precise information on plant health and stress levels. This involves tailoring pest management plans, scheduling irrigation, and optimizing fertilizer application based on real-time, field-specific data. By enabling the spatial mapping of pigment data and enabling targeted actions to increase crop output while reducing environmental effect, integrating GPS capabilities further increases its usefulness.

Research Applications

In agricultural research, the tool is helpful for examining how different treatments (such as fertilizers, herbicides, and irrigation techniques) affect plant health and pigment levels. In agricultural research, the multi-pigment meter is a vital tool for examining the effects of various

treatments, including fertilizers, pesticides, and irrigation techniques, on plant health and pigment levels. The multi-pigment meter allows researchers to measure pigments like as carotenoids, chlorophyll, and others precisely, giving quantitative information on how these impact photosynthetic activity, stress responses, and overall plant vitality. By optimizing agricultural methods, this data increases crop sustainability, quality, and production. Researchers can track and examine spatial pigment variations thanks to the device's GPS integration, which improves research findings.

Observation of the environment

In addition to its use in agriculture, the multi-pigment meter is essential for environmental monitoring. It is useful for evaluating and tracking the condition of the natural vegetation in ecosystems. Chlorophyll, carotenoids, and other pigments are measured by the device, which gives information about the physiological state of plants and how they react to environmental factors like pollution, climate change, and habitat disturbance. By pointing out areas of concern and directing management techniques to restore or maintain biodiversity, this knowledge supports conservation efforts. Furthermore, the multi-pigment meter aids in environmental assessments by offering quantitative information on vegetation health, supporting thorough ecosystem monitoring, and promoting sustainable land management techniques.

Recording data and analysis

The multi-pigment meter has strong data logging and analysis features that are augmented by GPS technology. Every measurement made using the multi-pigment meter is geo-tagged, allowing for accurate spatial mapping of pigment levels throughout natural ecosystems or agricultural fields. With the use of this geographical data, scientists and farmers can produce intricate maps that show how chlorophyll, carotenoids, and other pigments vary over wide regions. Stakeholders may learn a great deal about the dynamics of plant health, the effects on the environment, and the effectiveness of management techniques by examining these

patterns and trends over time. Making well-informed decisions to maximize agricultural productivity, conserve biodiversity, and implement sustainable land management techniques is supported by this analytical method.

Applications and Usages

In agriculture, efficient nutrient management is essential. Farmers modify nitrogen inputs according to chlorophyll levels, which are determined by instruments such as multi-pigment meters. This guarantees that crops receive the right quantity of fertilizer, improving nutrient uptake and reducing environmental impact. Stress detection is made possible by the multi-pigment meter, which enables prompt interventions to maintain crop health and production potential by detecting water stress or disease early on through changes in pigment levels. Furthermore, projecting crop productivity is aided by the correlation of pigment data with yield forecasts. This supports informed decision-making and sustainable farming practices that aim to maximize yield while preserving ecological balance.

Advantages

- Quick decision-making is made possible by real-time data, which offers instant feedback on plant health.
- High precision: GPS integration guarantees precise data point geolocation, which is crucial for precision farming.
- Non-destructive measurements enable ongoing observation throughout the growing season without endangering the plants.
- Cost-effective: Contributes to the optimization of input utilization, which may save expenses and boost productivity.

Conclusion

All things considered, the GPS-equipped multi-pigment meter is an effective instrument for raising agricultural sustainability and productivity through accurate and knowledgeable management techniques.