



Chlorophyll Content Meter for very small leaves

A lightweight, hand-held device for the accurate and easy determination of chlorophyll content in very small leaves and difficult to measure intact samples.



- ◆ Non-destructive
- ◆ Accurate and reliable
- ◆ Direct chlorophyll content (mg m^{-2})
- ◆ Hand-held, battery portable
- ◆ Touch screen, colour graphic display
- ◆ Large internal memory

Chlorophyll content of:



Needles



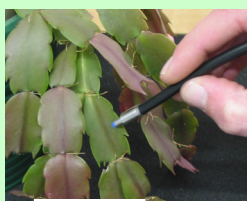
Grasses



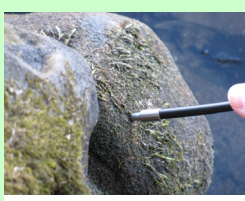
Conifers



Small leaves



Cactus



Moss and Lichens

Chlorophyll content determinations

The new CCM-300 is the world's first cost effective solution for the non-destructive measurement of chlorophyll content in very small leaves and other difficult to measure intact samples.

The CCM-200*plus* has established an outstanding reputation for the accurate and reliable determination of chlorophyll in broad leaves. However the absorption technique employed requires that the measuring area is fully covered by the sample, thereby restricting its use on many plant species.

New fluorescence technology

The CCM-300 uses a well established chlorophyll fluorescence technique that does not require the measuring aperture to be fully filled, allowing very small leaves, curved leaves and very thick samples to be measured quickly and non-destructively.

This fluorescence technique is also generally more accurate at higher chlorophyll concentrations than the traditional absorbance based meters.

Recent advances in technology developed for the CCM-300, has significantly reduced the cost of this traditionally expensive technique.

Proven scientific principles

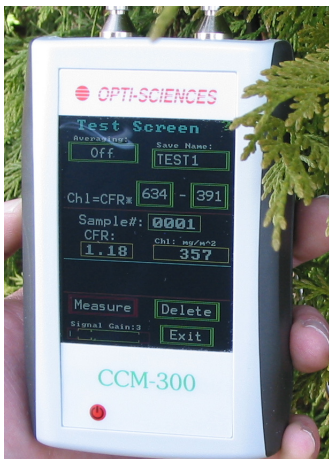
The design of the CCM-300 is based on the work of Gitelson* (1999) using the ratio of fluorescence at 735nm/700nm to determine chlorophyll content. Each measurement takes around only 5 seconds to perform and is presented as Chlorophyll Fluorescence Ratio (CFR) or as a direct chlorophyll content in mg m^{-2} . There has proven to be a high degree of correlation to traditional chemical assays using this technique.

Battery portable and easy to use

Weighing only 275gms the CCM-300 is a lightweight, hand-held, field portable instrument.

Powered by two AA rechargeable batteries, the power efficient CCM-300 will operate for up to 8 hours between charging.

Programming and operation is via a colour, touch screen display.



Data averaging, storage and download

Data may be made as:

- Single measurements
- Average of 2-30 measurements
- Average of 5-30 measurements with 2 sigma outlier removal.

The integral 2Gb data storage allows many thousands of experimental results to be saved, before downloading via the USB port. Stored data can be reviewed in the field.



ADC BioScientific Ltd.
Global House
Geddings Road
Hoddesdon
Herts. EN11 0NT
UK
Tel: +44 (0)1992 464527 Fax: +44 (0)1992 444245
sales@adc.co.uk www.adc.co.uk

Technical Specifications

Measured parameters: Chlorophyll Fluorescence Ratio (CFR) at 735nm/700nm, or direct chlorophyll content in mg m^{-2} (41mg m^{-2} to 675mg m^{-2})

Measurement area: Fibre optic probe with inner 3mm diameter circle. Samples smaller than 3mm can be measured accurately

Resolution: Ratio 0.01 or 1mg m^{-2}

Repeatability: Typical ratio 0.03. Averaging of multiple samples recommended

Sample measuring time: 5 seconds

Noise: $\pm 2\%$

Source: One LED 460nm modulating blue diode, half bandwidth 15nm

Detectors: Two solid state, high sensitivity detectors with band limiting filter sets. Simultaneous detection at 700nm to 710nm and 730nm to 740nm

Detection: Modulated light digitally controlled to minimise background detection. Temperature compensation for source and detector

Data modes: Single point and selectable 2-30 point average that disregards data beyond a 2 sigma standard deviation

Storage capacity: 2Gb non-volatile flash memory

User Interface: 240 x 320 pixel colour touch screen

Output: USB 1.1

Operating temperature range: $0-50^{\circ}\text{C}$

Batteries: 2 x Rechargeable AA batteries

Auto off interval: Programmable 0-20 minutes (with no key press or download)

Dimensions: 12 x 9 x 3 cm

Weight: 275g

Linear correlation to chemical assay:

41 mg m^{-2} to 675 mg m^{-2} with determination coefficient of $r^2 = 0.95$ or better

*** Reference:**

Gitelson A. A., Buschmann C., Lichtenthaler H.K.(1999). The Chlorophyll Fluorescence Ratio F735/F700 as an accurate measure of chlorophyll content in plants. Remote sense. environ. 69:296-302.