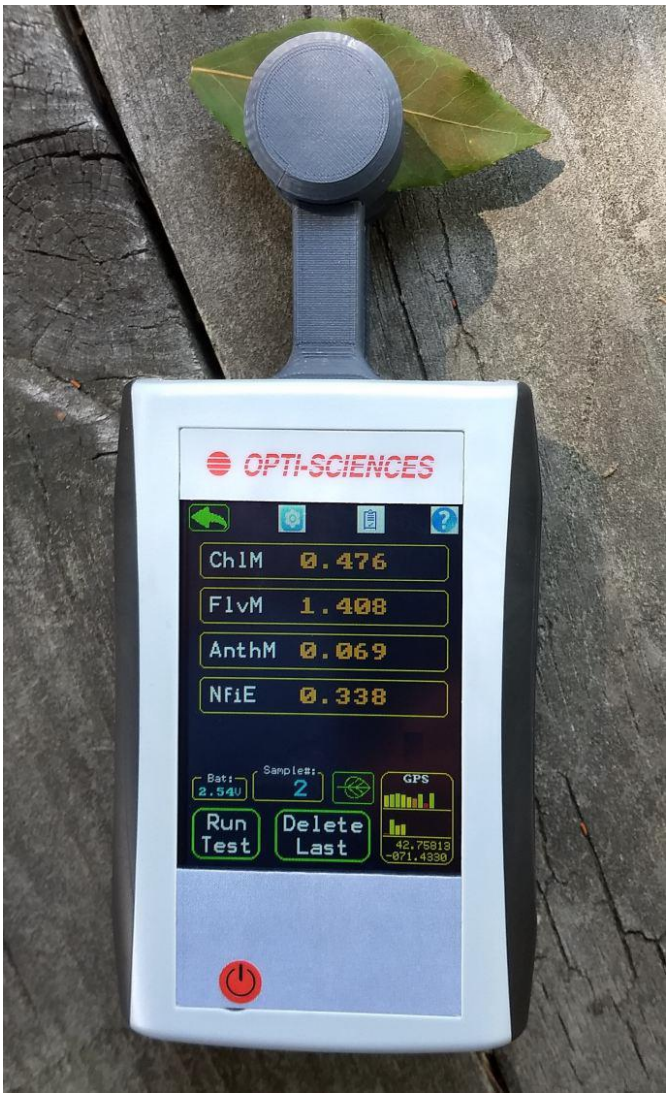
Multi-Pigment-Meter MPM-100



Measures:

Chlorophyll Content
Anthocyanin Content
Flavonol Content &
NFI (Nitrogen-Flavonol Index)

The MPM-100 or "Multi-Pigment-Meter", uses a combination of techniques to measure these very different parameters, in proven ways, *at the same time.*

Standard LED wavelengths:

Chlorophyll content: T850nm / T720mm
Flavonol content: F660nm / F325nm
Anthocyanin content: F660nm / F525nm
NFI: (T850nm/T720nm) / (F660nm/F325nm)

Other wavelength diodes may be ordered, to match measuring scales such as CCI or SPAD.

Advantages

Uses ratio fluorescence to measure anthocyanin content and flavonol content.

Uses leaf transmission in the far red and near infrared to measure chlorophyll content.

Uses the resulting chlorophyll and flavonol content measurements to determine the nitrogen-flavonol indicator.

Measurement modes include discrete single measurement and sample averaging (mean or median) of 2 to 8 samples.

Almost unlimited measurement storage, with 4GB non-volatile flash memory.

USB output: Comma delineated files can be opened directly in spreadsheet software.

Graphic color touchscreen data display.

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Chlorophyll Content

Chlorophyll Content is a very sensitive test for nitrogen and sulfur plant stress, amongst many other types. For that reason, chlorophyll content measurement use is common for nitrogen fertilizer management. When test plant measurements drop to 90% of values from a well fertilized plant, it is time to add nitrogen. This system measures at different wavelengths than most chlorophyll meters to also allow determination of "Nitrogen-Flavonol Index".

Chlorophyll content:
T850nm / T720nm

Flavonol Content

Flavonols appear yellow in plants. Evidence shows that they help photo-protect plants in the UV light spectrum and scavenge reactive oxygen species to protect plant photosynthesis. Flavonols are a good indicator of plant nitrogen status.
The yellow colour may also attract pollinators.

Flavonol Content:
The result of ratio fluorescence F660nm / F325nm

Anthocyanin Content

Anthocyanins in plants can be red, blue, purple or colourless depending on pH environment. Research shows that they may have a role in extreme plant temperature protection, the attraction of pollinating animals and the promotion of animal seed distribution.

Anthocyanin Content:
The result of ratio fluorescence F660nm / F525nm

Nitrogen Flavonol Index, NFI

Chlorophyll and flavonols are good indicators of nitrogen status in plants. Under nitrogen deficiency, plants produce more flavonoids or carbon based compounds.
NFI is less sensitive to leaf age and leaf thickness than standard chlorophyll content measurements.

Nitrogen Flavonol Index:
Chlorophyll (T850 / T720)

Flavonol (F660 / F325)

Assessment of Wine Grape Ripeness

Flavonol and Anthocyanin contents are also very useful in determining grape maturity in the wine industry.

To assess grape ripeness, "berry cap" samples can be taken. The picture below shows samples taken with different levels of anthocyanins & flavonols on certain types of grapes. The caps were placed on microscope slides with cover slips and measured with MPM-100. Samples were cut using a 7mm cork borer and a razor blade(a)

Unique Advantages of Ratio Fluorescence

- Provides non-destructive measurement of several important plant chemicals at the same time.
- Successful measurements on even very small or opaque samples.

Ratio fluorescence

Both the MPM-100 anthocyanin and flavonol measurements use a ratio fluorescence method.

Citations exploring ratio fluorescence for measurement of anthocyanin, flavonol and chlorophyll content:

Yves Goulas, Zoran G. Cerovic, Aurélie Cartelat, and Ismaël Moya (2004) "Dualex: a new instrument for field measurements of epidermal ultraviolet absorbance by chlorophyll fluorescence". Applied Optics Vol. 43, Issue 23, pp. 4488-4496 (2004) https://doi.org/10.1364/AO.43.004488

Z.G. Cerovic, N.Moise, G. Agatic, G. Latouchea, N. Ben Ghozlena, S. Meyera (2008) "New portable optical sensors for the assessment of wine grape phenolic maturity based on berry fluorescence". Journal of Food Composition and Analysis Volume 21, Issue 8, December 2008, Pages 650-654

Anatoly A Gitelson, Claus Buschmann, Hartmut K Lichtenthaler (1999) "The Chlorophyll Fluorescence Ratio F735/F700 as an Accurate Measure of the Chlorophyll Content in Plants". Remote Sensing of Environment Volume 69, Issue 3, September 1999, Pages 296-302 https://doi.org/10.1016/S0034-4257(99)00023-1

(a) Cerovic Z.G. et al (2008)

Technical Specifications

Measured Parameters: **Relative** Chlorophyll Content, Flavonol, Anthocyanin and Nitrogen-Flavonol Index

Measurement Area: 9.5mm diameter circle

Distance from edge of measuring head to measurement area: 9mm

Repeatability: +/- 1%

Noise: <+/- 2%

Sources: **Chlorophyll content:** Medical grade LED at 720nm & IR LED at 850nm
Flavonol content: LED at 325nm & LED at 660nm
Anthocyanin content: LED at 525nm & LED at 660nm

Fluorescence Detector: Single channel Si Photodiode with detection from 720nm to 900nm range

Transmittance Detectors: Single channel Si Photodiode with diffuser to measure from 405nm to 950nm

Detection: Modulated light digitally controlled to minimize background detection
Temperature compensation included for light source and detector

Storage Capacity: 4GB of non-volatile flash memory

Modes: Single point measurement, averaging of 2 to 8 measurements, median and mean values

User Interface: 240 x 320px color touchscreen Output: USB 1.1

Temperature Range: 0-50°C

Power Source: 2 Rechargeable AA batteries. Charger supplied with instrument

'Auto Off' Interval: (no key press or download) Programmable from 0 to 20 minutes

Size: 78mm x 180mm x 50mm. Weight: 0.6lb / 275g

Measuring time: 5s

GPS: Location accuracy range: 0.3m to 2.5m. Longitude, latitude, number of satellites and DOP

Components Included:

MPM-100 Multi-Pigment Meter,

Battery charger,

4 AA NiMH rechargeable batteries,

USB cable,

Carrying case

Manual