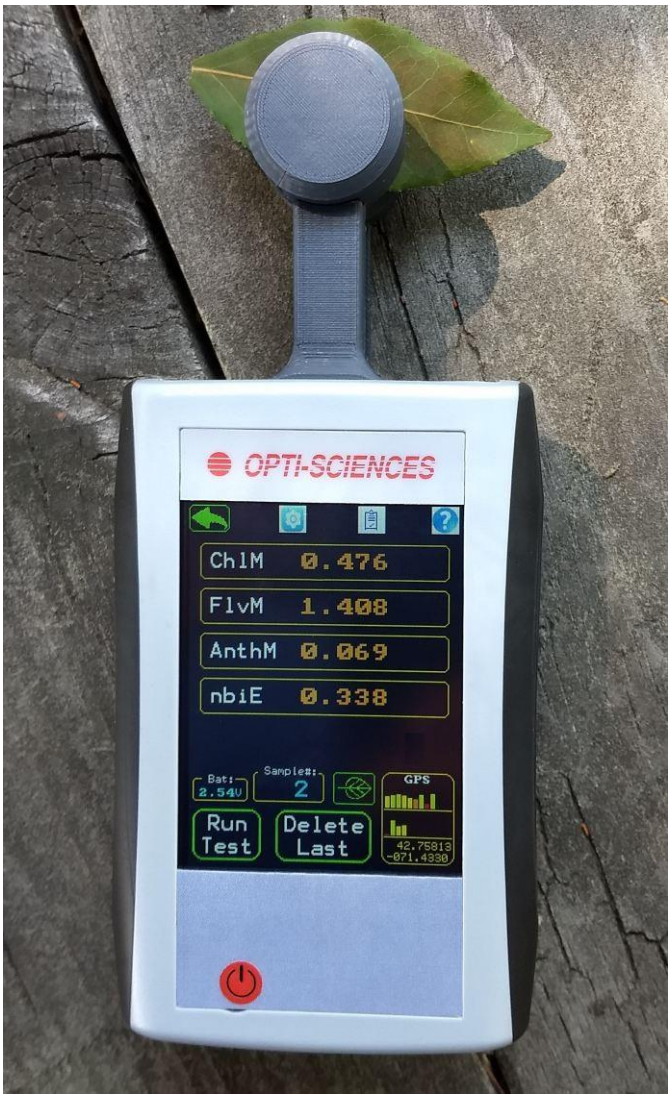
Multi-Pigment-Meter MPM-100



Measures:

Chlorophyll Content
Anthocyanin Content
Flavonol Content &
NBI (Nitrogen Balance 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
NBI: (T850nm/T720nm) / (F660nm/F325nm)

Other wavelength diodes may be ordered, to match other 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 an index of the nitrogen balance.

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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MPM-100 Multi-Pigment-Meter

Chlorophyll Content

Chlorophyll content is a very sensitive test for nitrogen and sulfur plant stress. This test is common for nitrogen fertilizer management. When test plant values drop to <90% of well fertilized plants, it is time to add nitrogen.

MPM-100 uses two light wavelengths that transmit through the leaf to measure chlorophyll content.

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 under oxidative plant stress conditions to protect photosynthesis. Flavonols are also a good indicator of plant nitrogen status. The yellow color may also attract pollinators.

Flavonol content:

Ratio fluorescence - F660 / F325

Anthocyanin Content

Anthocyanins in plants can be red, blue, purple or colourless, depending on the pH of the environment.

Research shows that they have a role in extreme plant temperature protection, assessment of grape ripening, the attraction of pollinating animals and the promotion of animal seed distribution.

Anthocyanin content:

Ratio fluorescence - F660 / F525

Nitrogen Balance Index

Chlorophyll and flavonols are good indicators of nitrogen status in plants. Under optimal conditions, plants produce chlorophyll and few flavonols. Under nitrogen deficiency, plants produce more flavonols or carbon base compounds. NBI has the advantage that it is less sensitive to leaf age differences and leaf thickness differences than standard chlorophyll content measurements.

Chlorophyll value

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Flavonol (T850 / T720) / (F660 / F325)

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Assessment of wine grape ripeness.

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)]

(a)
Z.G. Cerovic, N. Moise, G. Agati, G. Latouche, N. Ben Ghozlen, S. Meyera (2008) “New portable optical sensors for the assessment of winegrape phenolic maturity based on berry fluorescence”. Journal of Food Composition and Analysis 21 (2008) 650– 654

GPS

GPS Position accuracy:

The MPM-100 GPS positioning accuracy can achieve a maximum accuracy of 0.3 meters, depending on the satellite systems available at the time of use.
The image above indicated that 5 satellites were involved and ‘Dilution of Precision’ (DOP) was 1.0m.

How it works:

For best location accuracy, the 72-channel GPS system automatically works with several GPS satellite systems around the world:

SBAS L1 C/A: WAAS (US satellite system), EGNOS (European Geostationary Overlay System), MSAS (Japanese MTSAT satellite system), GAGAN (Indian GPS satellite system), GPS/QZSS L1 C/A (A Japanese satellite system, BeiDou B11 (Chinese satellite system), Galileo E1B/C (European Union satellite system) and the GLONASS L10F (Russian satellite system).

MPM-100 Multi-Pigment-Meter

Ratio fluorescence provides a method for fast, non-destructive measurement of several important plant chemicals at the same time. Flavonol and Anthocyanin contents are also very useful in determining grape maturity in the wine industry.

The MPM-100 joins the impressive list of Opti- Sciences field portable devices.

Designed for long life, reliable and repeatable measurement. Research using Opti-Sciences instruments from the early 1990s, still appear in research journals today and feed into a wealth of newly published papers.

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

Technical Specifications

Measured Parameters: Relative chlorophyll content values, relative flavonol values, relative anthocyanin values and relative nitrogen balance index.

Measurement Area: 9.5mm diameter circle

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

Repeatability: +/- 1%

Noise: <+/- 2%

Source: **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: Up to 4GB of non-volatile flash memory

Modes: Single point measurement, & measurement averaging for 2 to 8 samples, averaging with 2 sigma outlier removal, or median determination.

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 and manual.