PSI (Photon Systems Instruments), spol. s r.o.
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Small, Portable and Low-Cost PlantPen NDVI 300 & PRI 200

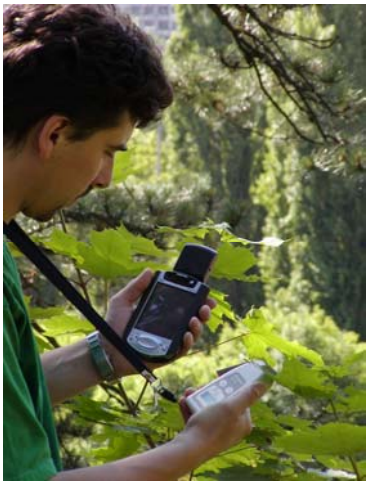
- Simple operation and ergonomic, robust design.
- Useful for applications agriculture, plant biology, horticulture, etc.
- Normalized Difference Vegetation Index (**NDVI**).
- Photochemical Reflectance Index (**PRI**).
- Mapping of photosynthetic carbon gain.
- Uploaded calibration data files for different species.
- High-performance PDA computer with wireless communication.*
- Global Positioning System module.*
- FluorWin software package for Windows XP and Windows CE.
- No PC required.

NDVI :

- **NDVI = (NIR – VIS) / (NIR + VIS)**.
- Chlorophyll content indicator.
- Indexed chlorophyll content reading in less than 0.1 second.
- Four different multiplication constants.
- Leaf nitrogen content. *

PRI :

- **PRI = (R_{531} - R_{570}) / (R_{531} + R_{570}).**
- Xanthophyll interconversion.
- Photosynthetic light-use efficiency (LUE).
- Net crop CO_2 uptake.
- Senescence detection



Agronomy and Forestry:

- High-yield crops.
- Nutrient – fertilizer analysis.
- Plant health.

Photosynthetic Research:

- Field measurement.
- Mutant screening.
- Stress detection.

Optical Indices Used in Plant Physiology

We offer custom-designed PlantPens for the measurement of various optical indices. Here is the list of parameters that can be used in our **PlantPens**.

Vegetation Index	Equation	Reference
Structural Indices:		
Normalized Difference Vegetation Index (NDVI)	NDVI = $(R_{NIR} - R_{red})/(R_{NIR} + R_{red})$	Rouse *et al.* (1974)
Renormalized Difference Vegetation Index (RDVI)	$RDVI = (R_{800} - R_{670}) / \sqrt{(R_{800} + R_{670})}$	Rougean and Breon (1995)
Simple Ratio Index (SR)	SR = RNIR/Rred	Jordan (1969); Rouse *et al.* (1974)
Modified Chlorophyll Absorption in Reflectance Index (MCARI1)	$MCARI1 = 1.2 * [2.5 * (R_{800} - R_{670}) - 1.3 * (R_{800} - R_{550})]$	Haboudane *et al.* (2004)
Modified Chlorophyll Absorption in Reflectance Index (MCARI2)	$MCARI2 = \frac{1.5 * [2.5 * (R_{800} - R_{670}) - 1.3 * (R_{800} - R_{550})]}{\sqrt{(2 * R_{800} + 1)^2 - (6 * R_{800} - 5 * \sqrt{R_{670}}) - 0.5}}$	Haboudane *et al.* (2004)
Improved SAVI with Self-Adjustment Factor L (MSAVI)	$MSAVI = \frac{1}{2}\left[2 * R_{800} + 1 - \sqrt{(2 * R_{800} + 1)^2 - 8 * (R_{800} - R_{670})}\right]$	Qi *et al.* (1994)
Optimized Soil-Adjusted Vegetation Index (OSAVI)	OSAVI = (1 + 0.16) * (R800 – R670) / (R800 + R670 + 0.16)	Rondeaux *et al.* (1996)
Chlorophyll Indices:		
Greenness Index (G)	G = $(R_{554})/(R_{677})$	-
Modified Chlorophyll Absorption in Reflectance Index (MCARI)	MCARI = $[(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550})] * (R_{700} / R_{670})$	Daughtry *et al.* (2000)
Transformed CARI (TCARI)	TCARI = $3 * [(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550}) * (R_{700} / R_{670})]$	Haboudane *et al* (2002)
Triangular Vegetation Index (TVI)	$TVI = 0.5 * [120 * (R_{750} - R_{550}) - 200 * (R_{670} - R_{550})]$	Broge and Leblanc (2000)
Zarco-Tejada & Miller	ZM = $(R_{750})/(R_{710})$	Zarco-Tejada *et al.* (2001)
Simple R. Pigment Ind. (SRPI)	SRPI = $(R_{430})/(R_{680})$	Peñuelas *et al.* (1995)

Normalized Phaeophytinization Index (NPQI)	$NPQI = (R_{415} – R_{435})/ (R_{415} + R_{435})$	Barnes *et al.* (1992)
Photochemical Reflectance Index (PRI)	$PRI = (R_{531} - R_{570})/(R_{531} + R_{570})$	Gamon *et al.* (1992)
Normalized Pigment Chlorophyll Index (NPCI)	$NPCI = (R_{680} - R_{430})/ (R_{680} + R_{430})$	Peñuelas *et al.* (1994)
Carter Indices	$Ctr1 = (R_{695})/(R_{420})$ $Ctr2 = (R_{695})/(R_{760})$	Carter (1994) Carter *et al.* (1996)
Lichtenthaler Indices	$Lic1 = (R_{800} - R_{680})/ (R_{800} + R_{680})$ $Lic2 = (R_{440})/(R_{690})$	Lichtenthaler *et al.* (1996)
Structure Intensive Pigment Index (SIPI)	$SIPI = (R_{800} - R_{450})/ (R_{800} + R_{650})$	Peñuelas *et al.* (1995)
Gitelson and Merzlyak	$GM1=R_{750}/R_{550}$ $GM2=R_{750}/R_{700}$	Gitelson & Merzlyak (1997)

REFERENCES: STRESS DETECTION IN CROPS WITH HYPERSPECTRAL REMOTE SENSING AND PHYSICAL SIMULATION MODELS P.J. ZARCO-TEJADA, A. BERJÓN, AND J.R. MILLER

Technical specification: NDVI

Measured parameters	Dual wavelength optical absorbance (644 nm and 760 nm)
Light intensity setting	Auto calibration
Detector	PIN photodiode with bandpass filters
Sample holder	Mechanical leaf clip
Acoustic indication	Piezo beeper
Real time	Year, month, day, hour, minute, second
FluorWin 4.0 software	Windows CE , Windows 2000, XP or higher
Bios	Upgradeable firmware
Communication	Bluetooth 1.1 *
Memory capacity	Up to 4 Mb (more than 100,000 measurements), unlimited with PDA
Power supply	Four rechargeable or alkaline batteries
Power save mode	Auto sleep
Battery life-time	48 hours of full operation
Size	56 x 30 x 120 mm
Weight	200 g

* These functions are available in special models

Technical specification: PRI

Measured parameters	Dual wavelength optical absorbance (530 nm and 575 nm)
Light intensity setting	Auto calibration
Detector	PIN photodiode with bandpass filters
Sample holder	Mechanical leaf clip
Acoustic indication	Piezo beeper
Real time	Year, month, day, hour, minute, second
FluorWin 4.0 software	Windows CE , Windows 2000, XP or higher
Bios	Upgradeable firmware
Communication	Bluetooth 1.1 *
Memory capacity	Up to 4 Mb (more than 100,000 measurements), unlimited with PDA
Power supply	Four rechargeable or alkaline batteries
Power save mode	Auto sleep
Battery life time	48 hours of full operation
Size	56 x 30 x 120 mm
Weight	200 g

* These functions are available in special models

FluorPen Software:

- Windows 2000/XP for desktop or notebook PCs, Windows CE for Pocket PC and PDA.
- Wireless Bluetooth communication.
- Real-time and remote control functions.
- User-friendly.
- GPS mapping plug-in.
- High-end tool for scientists.
- Export to Microsoft Excel.

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