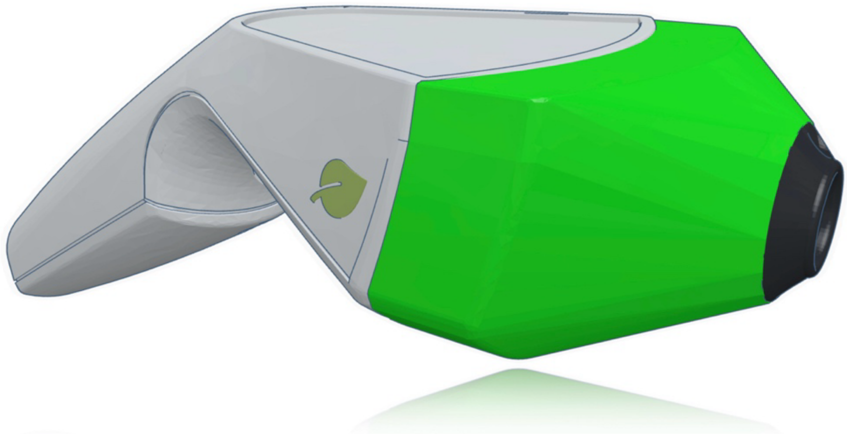

COMPOLYTICS® ScanCorder Implemented Vegetation Indices

VI-VNIR

Release December 2025

COMPOLYTICS

We see light differently.

General Approach

The ScanCorder is a spectral optical scanner for the approximate determination of multiple chemical compounds and the microstructure of a sample under measurement. A multispectral reflectance measurement based on inverted spectroscopy with typically application-specific wavelengths is implemented based on the COMPOLYTICS® ScanCorder technology platform. The recorded spectral signature is converted into the measured variables using an application-specific calibration model based on machine learning.[1]

Specific Implementation of the *Vegetation Index – Visible and Near Infrared* (VI-VNIR) Head

In addition to sensors with application-specific spectral bands and tailored calibration models, common predefined wavelength combinations in specific regions of the electromagnetic spectrum[2] are available, facilitating specific types of applications.

With the *VI-VNIR ScanCorder*, the wavelength bands are optimally distributed across the visible and near-infrared ranges, facilitating the calculation of a wide variety of plant vegetation indices.

The *VI-VNIR ScanCorder* is a handheld sensor with a contact probe. It has proven its suitability for scanning crop plants, such as leaves, seeds, fruits, in agriculture and plant breeding as well as food-related applications. Special geometries of the measurement head are available on request.

Available Plant Vegetation Indices

As of December 2025, there are 145+ plant-related vegetation indices available using the VI-VNIR sensor[3]. All vegetation indices can be calculated immediately after each scan and displayed in CICADA. In addition, a user-specific selection of these indices can be displayed in real time for a quick overview.

Batch export of raw spectra from the Record tab allows extended offline analysis and enables use with the free Compolytics R package for extended vegetation-index processing (https://compolytics.com/vi-ppda).

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[1] For definitions of terms and a brief explanation of the physical background of optical spectroscopy, see Optical Spectroscopy and its Variants.
[2] Within the scope of the commercial availability of standard LEDs and photodetectors.
[3] Based on vegetation indices published in public databases and peer-reviewed scientific journals, and implemented in Compolytics CICADA and the corresponding R package. Additional vegetation indices may be developed from the acquired raw data.

Table 1: The 145 available plant vegetation indices, showing name, abbreviation, and associated wavelengths.

Name	Short Name	Wavelengths
Anthocyanin Reflectance Index 1	ARI	550, 700
Anthocyanin Reflectance Index 2	ARI2	550, 700, 800
Simple Ratio 400/550, Blue Green Pigment Index-1	BGI1	400, 550
Simple Ratio 450/550, Blue Green Pigment Index	BGI2	450, 550
Simple Ratio 400/690, Blue/Red pigment Index-1	BRI1	400, 690
Simple Ratio 450/690, Blue red pigment index	BRI2	450, 690
Simple Ratio, Chlorophyll Absorbance Reflectance	CAR	515, 570
Carotenoid Reflectance Index 550 nm with NIR correction	CARgreen	510, 550, 770
Carotenoid Reflectance Index 700 nm with NIR correction	CARrededge	510, 700, 770
Chlorophyll/Carotenoid Index	CCI	531, 645
Simple Ratio 750/710, Zarco-Tejada and Miller (ZM), Combined Index	CI	710, 750
Carotenoid Reflectance Index 1	CRI1	510, 550
Carotenoid Reflectance Index 2	CRI2	510, 700
Simple Ratio 695/760, Carter2	Ctr2	695, 760
Simple Ratio 605/760, Carter3	Ctr3	605, 760
Simple Ratio 710/760, Carter4	Ctr4	710, 760
Simple Ratio 850/710, Datt2	Datt2	710, 850
Simple Ratio 754/704, Datt3	Datt3	704, 754
Datt4	Datt4	550, 672, 708
Simple Ratio 672/550, Datt5	Datt5	550, 672
Reflectance Band Ratio	Datt6	550, 708, 860
Difference Index	DI	550, 800
Ratio of PRI to Simple Ratio	DRIpri	531, 570, 670, 800
Difference Vegetation Index	DVI	680, 800
Disease-Water Stress Index 4	DWSI4	550, 680
Enhanced Vegetation Index	EVI	420:480, 640:760, 780:1400
Enhanced Vegetation Index 2	EVI2	640:760, 780:1400
Simple Ratio 690/735, Fluorescence Ratio	FR	690, 735
Simple Ratio 690/740, Fluorescence Ratio 2	FR2	690, 740
Green Chlorophyll Index a	GCIa	520:585, 780:1400

Green Chlorophyll Index b	GClb	695:740, 780:1400
Greenness Index 2	GI	554, 677
Green Leaf Index	GLI	420:480, 480:570, 640:760
Gitelson and Merzlyak Index 1	GM1	550, 750
Simple Ratio 750/700, Gitelson and Merzlyak Index 2	GM2	700, 750
Green Normalized Difference Vegetation Index, GNDVIhyper2	GNDVI[800,550]	550, 800
Simple Green Red Ratio, Green Red Vegetation Index	GR	490:570, 640:760
Simple Ratio, Green Difference Vegetation Index, Green Ratio Vegetation Index, Simple Ratio 1	GRVI	480:570, 780:1400
Leaf Chlorophyll Index	LCI	680, 710, 850
Simple Ratio 690/440, Lichtenthaler indices 1	Lic1	440, 690
Simple Ratio 440/690, Lichtenthaler indices 2	Lic2	440, 690
Simple Ratio 440/740, Lichtenthaler indices 3	Lic3	440, 740
Ratio between MCARI and OSAVI 750	MCARI/OSAVI750	550, 705, 750
Modified Chlorophyll Absorption in Reflectance Index 1	MCARI1	550, 670, 800
Modified Chlorophyll Absorption in Reflectance Index 2	MCARI2	550, 670, 800
Modified Chlorophyll Absorption in Reflectance Index 705, 750	MCARI705	550, 705, 750
Modified Chlorophyll Absorption in Reflectance Index 710	MCARI710	550, 710, 750
Modified Green Red Vegetation Index	MGRVI	490:570, 640:760
Modified Normalized Difference Index	mNDI	445, 705, 750
Modified Soil Adjusted Vegetation Index (Hyper)	MSAVI	670, 800
Modified Soil Adjusted Vegetation Index 1	MSAVI1	640:760, 780:1400
Modified Simple Ratio Index 1	mSRI1	445, 705, 750
Modified Simple Ratio 2	mSRI2	670, 800
Modified Simple Ratio NIR/RED	MSRNir/Red	640:760, 780:1400
Medium (MERIS) Terrestrial Chlorophyll Index	MTCI	680, 710, 750
Modified Transformed Vegetation Index, Modified Triangular Vegetation Index 1	MTVI	550, 670, 800
Ratio between MTVI and MSAVI	MTVI/MSAVI	550, 670, 800
Modified Triangular Vegetation Index 2	MTVI2	550, 670, 800
Narrow-band normalized difference vegetation Index	NBNDVI	680, 850

Normalized Difference Index, Normalized Difference 800/680 Pigment specific normalised difference A2, Lichtenthaler indices 1, NDVIhyper	NDI	680, 800
Normalized Difference Red Edge Index	NDRE	717, 840
Normalized Difference Vegetation Index	NDVI	620:670, 750:810
Normalized Difference Vegetation Index 1	NDVI1[760, 708]	708, 760
Normalized Difference Vegetation Index 2	NDVI2[800, 600]	600, 800
Normalized Difference Vegetation Index 3, GNDVIhyper	NDVI3[780, 550]	550, 780
Normalized Difference Vegetation Index 4	NDVI4[800, 700]	700, 800
Normalized Difference 750/550 Green NDVI	NDVIg	550, 750
Normalized green red difference index	NGRDI	490:570, 640:760
New Vegetation Index 1 (NVI1)	NVI1	673, 747, 777
Optimal Soil Adjusted Vegetation Index	OSAVI	670, 800
Powdery Mildew Index (sugar beet)	PMI	520, 584, 724
Photochemical Reflectance Index	PRI	531, 570
Photochemical reflectance index	PRI570	531, 570
Photochemical Reflectance Index	PRIm2	531, 600
Photochemical Reflectance Index	PRIm3	531, 670
Photochemical Reflectance Index	PRIm4	531, 570, 670
Pigment Specific Normalized Difference 1	PSND[800, 635]	635, 800
Normalized Difference 800/675, Pigment specific normalised difference A1	PSNDa1	675, 800
Normalized Difference 800/500, Pigment specific normalised difference C1	PSNDc1	500, 800
Plant Senescence Reflectance Index	PSRI	500, 680, 750
Simple Ratio, Pigment Specific, Optimized Vegetation Index 1	PSSRa	680, 800
Simple Ratio 800/675, Pigment specific simple ratio A1	PSSRa1	675, 800
Simple Ratio 800/635, Moisture Stress Index, Pigment Specific Simple Ratio (Cholophyll b)	PSSRb	635, 800
Simple Ratio 800/650, Pigment specific simple ratio B1	PSSRb1	650, 800
Pigment Specific Simple Ratio C1	PSSRc1	500, 800
Red-Edge Model Index	R-M	720, 750
Ratio 675/700/650	R675/700/650	650, 675, 700
Simple Ratio 760/500, Ratio Analysis of Reflectance Spectra	RARS	500, 760
Re-normalized Difference Vegetation Index	RDVI	670, 800
Red Edge Normalized Difference Vegetation Index	reNDVI	710, 750

Relative Greenness Index	RGI	550, 690
Red/Green Index	RGR1	490:570, 640:760
Red Green Ratio	RGR2	510, 560, 612, 660
Simple Ratio 801/670, Pigment Specific 2, Ratio Vegetation Index, NIR/Red	RVI	670, 801
Ratio Vegetation Index 1	RVI1	660, 810
Disease-Water Stress Index 4	RVI2	493, 678
Soil Adjusted Vegetation Index, N-content (early-mid period)	SAVI	670, 800
Sugar Beet Rust Index	SBRI	513, 570, 704
Structure Independent Pigment Index	SIPI1	445, 670, 800
Structure Intensive Pigment Index 1	SIPI2	445, 680, 800
Simple Ratio 520/670	SR[520,670]	520, 670
Simple Ratio 520/760	SR[520,760]	520, 760
Simple Ratio 542/750, Chl	SR[542,750]	542, 750
Simple Ratio 550/670	SR[550,670]	550, 670
Simple Ratio 550/760	SR[550,760]	550, 760
Simple Ratio 550/800	SR[550,800]	550, 800
Simple Ratio 556/750, Chl-b	SR[556,750]	556, 750
Simple Ratio 560/658, GRVIhyper	SR[560,658]	560, 658
Simple Ratio 570/670, Greenness Index	SR[570,670]	570, 670
Simple Ratio 605/670	SR[605,670]	605, 670
Simple Ratio 7	SR[672,550,708]	550, 672, 708
Simple Ratio 672/708	SR[672,708]	672, 708
Simple Ratio 674/553	SR[674,553]	553, 674
Simple Ratio 675/555	SR[675,555]	555, 675
Simple Ratio 675/700	SR[675,700]	675, 700
Simple Ratio 675/705	SR[675,705]	675, 705
Simple Ratio 678/750	SR[678,750]	678, 750
Simple Ratio 683/510	SR[683,510]	510, 683
Simple Ratio 685/735	SR[685,735]	685, 735
Simple Ratio 694/840	SR[694,840]	694, 840
Simple Ratio 695/800	SR[695,800]	695, 800
Simple Ratio 700	SR[700]	700
Simple Ratio 706/750, Chl-a	SR[706,750]	706, 750
Simple Ratio 750/705	SR[750,705]	705, 750

Simple Ratio 752/690	SR[752,690]	690, 752
Simple Ratio 760/695	SR[760,695]	695, 760
Simple Ratio 774/677	SR[774,677]	677, 774
Simple Ratio 800/550	SR[800,550]	550, 800
Simple Ratio 800/600	SR[800,600]	600, 800
Simple Ratio 801/550, NIR/Green	SR[801,550]	550, 801
Simple Ratio 810/560, Plant biochemical index	SR[810,560]	560, 810
Simple Ratio 833/658	SR[833,658]	658, 833
Simple Ratio 860/550	SR[860,550]	550, 860
Simple Ratio 860/708	SR[860,708]	708, 860
Triangular Greenness Index (TGI) 1	TGI1	420:480, 480:570, 640:760
Triangular Greenness Index (TGI) 2	TGI2	420:480, 480:570, 640:760
Transformed Vegetation Index 1	TVI1	640:760, 780:1400
Transformed Vegetation Index, Triangular Vegetation Index	TVI2	550, 670, 750
Visible Atmospherically Resistant Index	VARI	480, 555, 680
Visible Atmospherically Resistant Index	VARIgreen	420:480, 480:570, 640:760
Simple Ratio Pigment Specific 1	VIopt1	730, 760
Optimized Vegetation Index 2	VIopt2	730, 760
Wide Dynamic Range Vegetation Index alpha=0.05	WDRVIa	640:760, 780:1400
Wide Dynamic Range Vegetation Index alpha=0.1	WDRVIb	640:760, 780:1400
Wide Dynamic Range Vegetation Index alpha=0.2	WDRVIc	640:760, 780:1400

Optical Spectroscopy and its Variants

The term optical spectroscopy refers to a measuring principle that involves determining the properties of a sample by analysing the spectrum of light that is reflected or transmitted by the material of the sample. In technical terms, optical spectroscopy instruments use a combination of light emitting elements and receiving photodetectors to measure the reflectance or transmission of the material to provide information about its chemical composition and physical properties.

In ***traditional*** spectroscopy, a broad-spectrum light source is used to illuminate the sample, and a narrow-band receiver is used to measure the intensity of the reflected or transmitted light at specific wavelengths.

In contrast, in ***inverted*** spectroscopy, a narrow-band light source, such as an LED, is used to illuminate the sample at a specific wavelength, and a wideband receiver is used to measure the intensity of the reflected or transmitted light over a range of wavelengths.

The use of LEDs in inverted spectroscopy has a number of advantages over traditional techniques, such as lower power consumption, reduced energy input into the sample, and the ability to easily adjust the wavelengths of the light source rather than the receiver.

While in many applications of optical spectroscopy only the chemical composition of a sample is of primary interest and the geometrical structure is considered noise, there are specific applications that target this microstructure. Inverted spectroscopy can be extended to illuminate the sample with a series of wavelengths repeated from different angles. This provides additional information about the microstructure of the material and is called ***angular*** spectroscopy.

Unlike traditional and inverted spectroscopy, which involves measuring the spectrum of a material and using this information to determine its properties, ***inverse*** spectroscopy uses knowledge of the physical properties of the material to derive its spectrum.

In this context, the term ***hyperspectral*** denotes a quasi-continuous spectrum of very dense and equidistant sampling points, which is collectively modulated by all properties of the material above a certain detection level. A *multispectral* sensor comprises fewer and selected wavelengths, which are often tailored to a specific application.

(https://compolytics.com/optical-spectroscopy)