

# SPECTRAL EVOLUTION

## PSR+ Spectroradiometer & RT Sphere to Study Leaf Stress

By correlating reflectance, transmittance, and absorption measurements of leaf samples using a PSR+ field spectroradiometer and a reflectance/transmittance (RT) sphere, researchers can come to a better understanding of leaf characteristics, spectral red edge shift, and plant stress.

Typically, an increase in reflectance and transmittance and a decrease in absorption in the 695-725nm range can be a very good indication of a leaf's response to plant stress. The changes in these measurements noted in this wavelength range can be a sign that the plant is losing chlorophyll with a reduction that can be seen in the absorption features related to chlorophyll in the leaf.

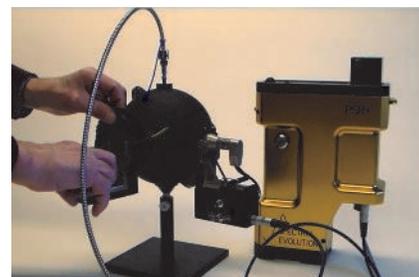
Spectral Evolution's reflectance/transmittance (RT) sphere can be used to measure reflectance and transmittance for a wide variety of sample types including vegetation samples such as leaves or needles. The RT sphere can be used for specular included or excluded reflectance measurement, measurement of forward and back scattering, and transmittance measurement of scattering transparent or turbid samples. At 6 inches in height and weighing less than 5 pounds, the RT sphere is portable and well-suited for field or lab use with field (PSR+) or lab (SR-4500) spectroradiometer.

An RT sphere allows you to collect all diffuse light reflected from a leaf since the inside of the sphere is a perfect reflecting diffuser—total hemispherical reflectance can be measured. With the high resolution spectra obtained from a Spectral Evolution spectroradiometer, the RT sphere can deliver detailed information about vegetation spectral features, such as comparisons of chlorophyll concentrations of leaves with the red-edge characteristics.

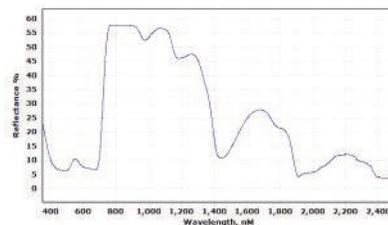
The PSR+ is a high resolution/high sensitivity field spectroradiometer covering the full UV/VIS/NIR range from 350-2500nm. The SR-4500 is a top-of-the-line lab unit with three thermoelectrically cooled photodiode arrays for the ultimate in platform stability and measurement repeatability.

Reflectance, transmittance, and absorption for healthy leaves as well as stressed leaves tend to show only slight differences in the 400-500nm range as opposed to those differences that are more prominent in the 695-725nm range.

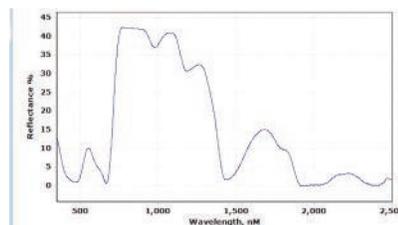
These signs of stress can be due to almost any cause that will result in less absorption of chlorophyll: water stress, pests, over use of fertilizer, flooding, herbicide misuse, flooding, elevated ozone and CO<sub>2</sub>, etc.



*SPECTRAL EVOLUTION field spectroradiometers and spectrometers are simple, non-destructive, reliable, fast and accurate for TPH in soil measurements.*



*Reflectance measurement of a violet leaf with the RT sphere and a PSR+*



*Transmittance measurement of a violet leaf with the RT sphere and a PSR+*

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