LI-COR System Comparison

Comparison of the LI-6800 Portable Photosynthesis System and the LI-600 Porometer/Fluorometer

	LI-6800	LI-600
Cuvette Design	Flexible design to evaluate a broad range of subject materials from small leaf areas and conifer needles to large area (36 cm^2) samples and aqueous algae samples	Fixed small leaf area optimized for high throughput (between 120 and 200 per hour) evaluations in ambient environmental conditions
Environmental Control	Accurate, precise, and fast measurement AND control of the important environmental drivers including; light, CO_2, temperature and H_2O. Ideally suited for sophisticated experiments mapping the response of subject materials to environmental drivers	Rapid measurements of Light, H_2O and Temperature; BUT NOT CO_2 and without any CONTROLS. Optimized for capturing a snapshot of leaf stomatal and biochemical status the instant the cuvette is applied.
Control over CO_2 and H_2O in the air stream or cuvette	YES	NO
Measures PPFD Leaf Light environment.	YES	YES **LI-600 Advantage:** Measurements of ambient light provide very rapid equilibration and the possibility of high throughput measurements typical in screening experiments.
Controls PPFD Leaf Light environment.	YES **LI-6800 Advantage:** With control over the light environment, you can design and implement experiments where tight control of light is important to avoid confounding light response with other variable responses or where it is desired to map the response of the leaf to a controlled change in light.	NO
Measures and controls CO_2 at the leaf	YES	NO

	LI-6800	LI-600
A_{net}: Net carbon assimilation, the balance between carbon uptake by carboxylation and carbon loss due to photorespiration and other respiratory processes	YES	NO
A_{sat}: Net assimilation at a saturating light intensity.	YES	NO
R_{PR}: Photorespiration, the result of the oxygenase activity of RUBISCO. Where RUBISCO oxygenates rather than carboxylates the substrate RUBP. Photorespiration is a competing process to photosynthetic carbon assimilation and inevitably leads to the release of previously fixed carbon	YES	NO
A_{max}: Net assimilation when neither light nor CO_2 are limiting photochemistry; net assimilation at a saturating light intensity and a saturating CO_2 concentration. A_{max} represents the maximum capacity of the leaf for carbon assimilation.	YES	NO
R_d: Proxy for mitochondrial respiration rate in the daylight. R_d can be estimated from nesting CO_2 response measurements within light response (A-Ci nested within AQ) curves.	YES	NO
R_n: Estimate of mitochondrial respiration rate in the dark. R_n can be estimated from a measure of A_{net} in the dark or from the y-intercept of a light response (AQ) curve.	YES	NO
$V_{c\,max}$: Maximum velocity of carboxylation by RUBISCO. Derived from fitting a function to the initial portion of the A-Ci curve where the availability of CO_2 limits the rate of carboxylation.	YES	NO
V_{TPU}: Velocity of triose phosphate utilization	YES	NO

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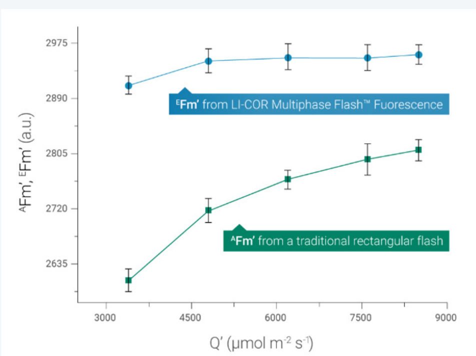
ΦCO_2: Quantum yield of Carbon Assimilation. The ratio of carbon molecules assimilated to absorbed photons. In C3 plants this value has a theoretical maximum of 0.125. Theoretically, ΦCO_2 and Φ_{PSII} are linearly related. However, as stresses increase, the balance between ΦCO_2 and Φ_{PSII} departs from the theoretical due to a shunting of excess energy to stress response mechanisms.	YES	NO
J_{max}: Maximum electron transport rate when light and CO_2 are non-limiting	YES	NO
Measures Leaf Temperature (Similar advantages as in Light Control).	YES	YES
Controls Leaf Temperature (Similar advantages as in Light Control).	YES	NO
Measures Water Vapor at the Leaf	YES	YES
Controls Water Vapor at the Leaf	YES	NO
g_s: Water vapor stomatal conductance	YES	YES
g_m: CO_2 mesophyll conductance. Measured with A-Ci or A-Q response curves in conjunction with electron transport measurements from fluorescence	YES	NO
VPD_{leaf}: Vapor pressure difference between the air and the leaf intercellular air space	YES	YES
WUE_g: Intrinsic water use efficiency. The ratio of net carbon assimilation (A_{net}) to stomatal conductance to water vapor (g_s); a metric that describes the potential water cost of carbon assimilation.	YES	NO

	LI-6800	LI-600
	In the LI-6800, fluorescence is measured while precisely controlling the environmental variables including light, CO_2, temperature, and H_2O, avoiding confounding effects of changing conditions.	In the LI-600, fluorescence is measured in the absence of environmental control. With no environmental control, equilibration before measurement is very fast allowing the instrument to capture a snapshot of leaf biochemical state the instant the cuvette is applied.
F_o: Minimum fluorescence yield in a dark-adapted leaf.	YES	YES
F_m: Maximum fluorescence yield in a dark-adapted leaf and during a saturation flash.	YES	YES
F_v/F_m: Maximum quantum efficiency of PSII photochemistry. ($[F_m-F_o]/F_m$)	YES	YES
F_s: Minimum fluorescence yield in a light adapted leaf	YES	YES
F_m': Maximum fluorescence yield in a light adapted leaf during a MultiPhase saturation flash (F_m') 	YES	YES
Φ_{PSII}: Quantum yield of PSII ($[F_m'-F_s]/F_m'$). The operating quantum efficiency at the current light intensity.	YES	YES
ETR: Electron transport rate ($\Phi_{PSII} * \alpha * f_{II} *$ PPFD). Derived from Φ_{PSII}, photosynthetic photon flux density (PPFD) incident on the leaf, an estimate of the fraction of PPFD absorbed by the leaf (α) and the partitioning ratio of photons between photosystem (PS)II and PSI (f_{II}).	YES	YES

	LI-6800	LI-600
NPQ: Non-photochemical quenching ($[F_m - F_m']/F_m'$). Proportional to excess light energy beyond what the leaf can use for photochemistry. Therefore, an increase in NPQ in the absence of an increase in light intensity represents a decrease in photochemistry and/or its efficiency. Increases in NPQ are typically observed in stressed material. NPQ estimates require measurements of chlorophyll fluorescence on leaves in a dark adapted and light adapted state.	YES	YES
F_o': In a light-adapted leaf, measures the minimum fluorescence yield in a transiently darkened leaf while simultaneously applying a far-red pulse which preferentially excites PSI leaving PSII electron acceptors fully oxidized and 'open'.	YES	NO
q_L: The proportion of 'open' (i.e., oxidized) PSII reaction centers; requires transient dark period while simultaneously applying far-red light. $([F_m' - F_s]/[F_m' - F_o']) * (F_o'/F_s)$	YES	NO
OJIP: A measure of the high frequency (µs to ms) fluorescence yield transients in a dark-adapted leaf during a saturation flash. Measurements require fast electronic sampleing.	YES	NO
Built in bar code reader for high throughput experiments	NO	YES

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