

REPORTING AND MONITORING FOR DIAGNOSTIC PURPOSES

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In order to conduct meaningful studies in controlled environments, it is important that researchers and facility managers have a clear idea as to the cultural conditions to be utilised, the environmental parameters to be monitored and controlled, the type and location of sensors, and the frequency of measurements to be made. Previously published guidelines should be consulted for guidance in standardising the type and location of environmental sensors in the growth chamber.

Ideally, a checklist of cultural and environmental conditions and a log book should be kept and careful notes recorded whenever problems are observed or adjustments in set points are made. Careful records of environmental conditions provide a valuable diagnostic tool in deciding when to make adjustments in control settings and in interpreting any unexpected results in plant response.

To minimise soil moisture stress, root restriction, and other limiting factors, it is important that careful consideration be given to choice of substrate, container volume, and water and nutrient regime and that these be thoroughly described.

For most studies, the most critical parameters to control and record are photosynthetic photon flux, air temperature ($^{\circ}\text{C}$), and atmospheric moisture. In many cases, carbon dioxide concentration ($\mu\text{mol mol}^{-1}$, Pa, or mol m^{-3}), spectral distribution ($\mu\text{mol m}^{-2} \text{s}^{-1} \text{nm}^{-1}$ or $\text{W m}^{-2} \text{nm}^{-1}$), and soil temperature are also essential. For experiments conducted in solution culture, where periodic adjustments in pH and nutrient composition must be made, it is important to have good records of hydrogen ion concentration (pH), electrical conductivity (mS m^{-1}), and dissolved oxygen (mg L^{-1}).

Ideally, measurements of photon flux ($\mu\text{mol m}^{-2} \text{s}^{-1}$) or energy flux (W m^{-2}) and temperature should be taken at the top of the plant canopy. For long-term studies, it may be impractical to adjust shelf height and thereby maintain uniform PPF levels at the top of the canopy but at least the PPF range can be described. To ensure accuracy, researchers should have access to within-laboratory calibrators and reference calibrators. To facilitate comparisons of data with those from other facilities, measurements should be reported in SI units.