Supplementary Material

Vegetative growth, biomass allocation, and chlorophyll fluorescence of vanilla (*Vanilla planifolia*) as affected by light intensity and nitrogen supply

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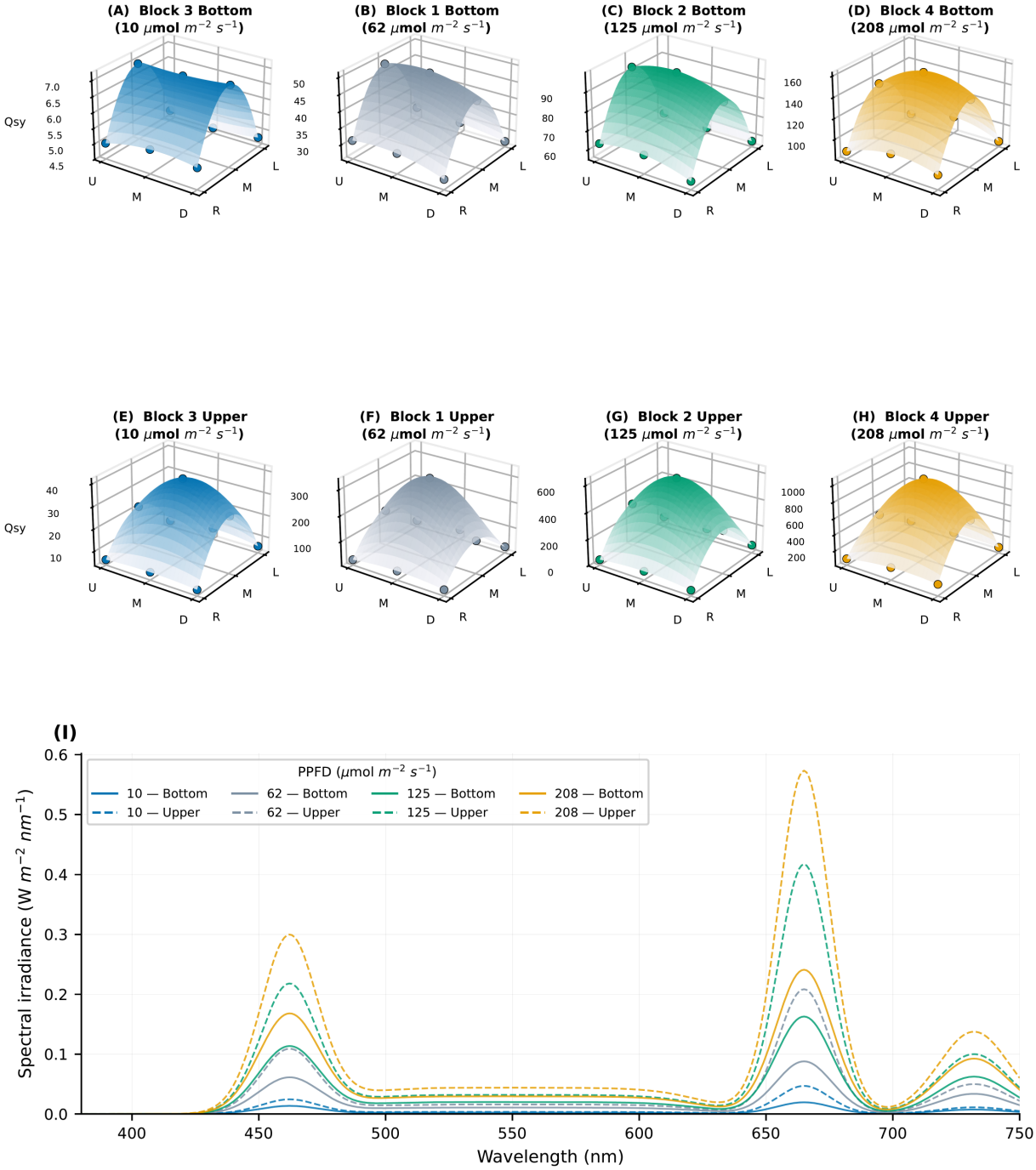

Fig.S1. Spatial distribution of photosynthetically active radiation (PAR) and spectral irradiance characterisation across four LED photosynthetic photon flux density (PPFD) treatments, recorded using a handheld PAR measuring device (BTS256-PAR, Gigahertz-Optik, Germany). **(A–D)** Three-dimensional perspective surface plots of photosynthetically active photon flux density (Q_{sy}, mol m^{-2} s^{-1}) measured at substrate level for Blocks 3, 1, 2 and 4, corresponding to mean PPFD levels of 10, 62, 125 and 208 mol m^{-2} s^{-1}, respectively. **(E–H)** Corresponding surface plots for the upper shelf level, measured 70 cm above substrate level. Surfaces were generated by bicubic interpolation of a 3 × 3 measurement grid (n = 9 positions per panel); dots indicate actual measurement positions. Grid axes denote lateral (Left, L; Middle, M; Right, R) and longitudinal (Up, U; Mid, M; Down, D) shelf positions. **(I)** Spectral irradiance distribution (380–750 nm) of the LED light source. Solid lines represent the bottom shelf (substrate level), dashed lines the upper shelf (70 cm above substrate). Colours denote mean PPFD level: 10 (blue), 62 (slate), 125 (green) and 208 mol m^{-2} s^{-1} (orange). Each spectrum is the mean of n = 9 measurement positions per block and shelf level (n = 72 total across all blocks and levels).