

Title: Characterization of photosynthetic gas exchange in leaves under simulated adaxial and abaxial surfaces alternant irradiation

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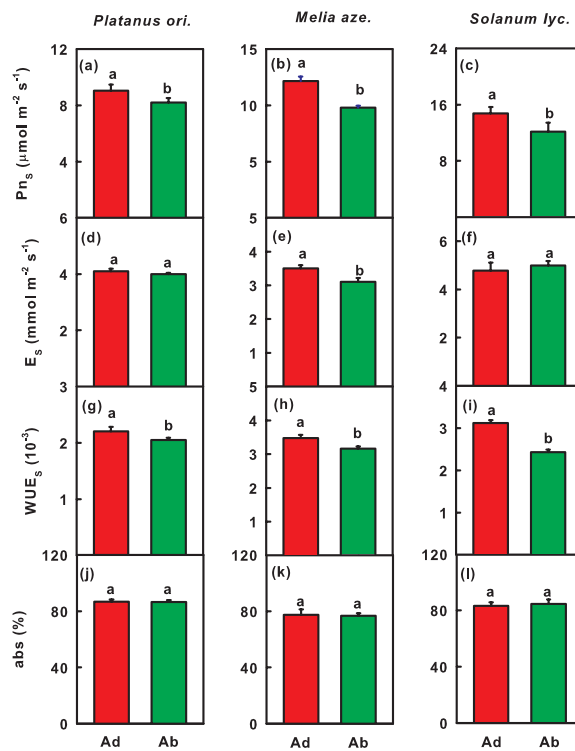
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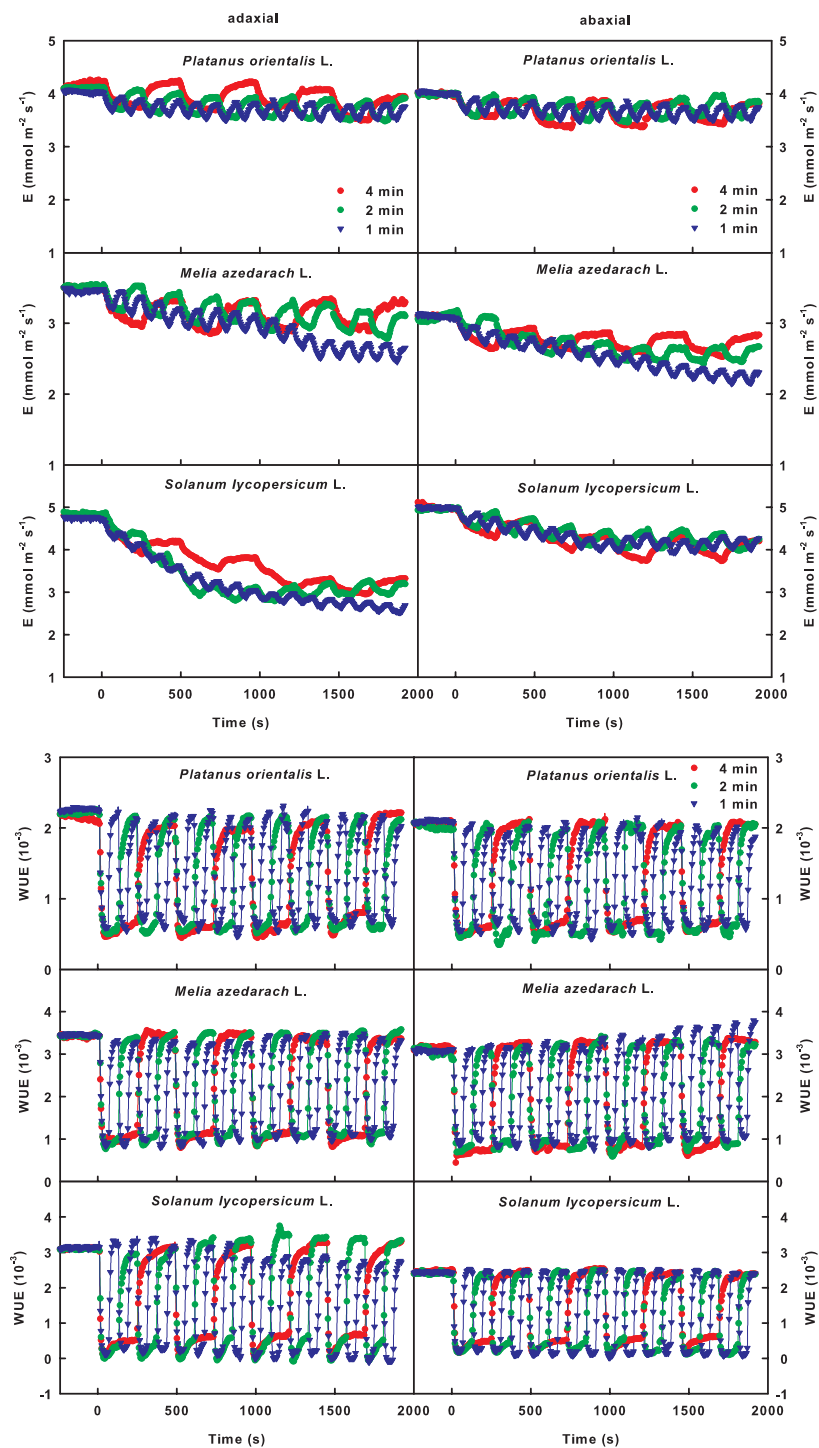
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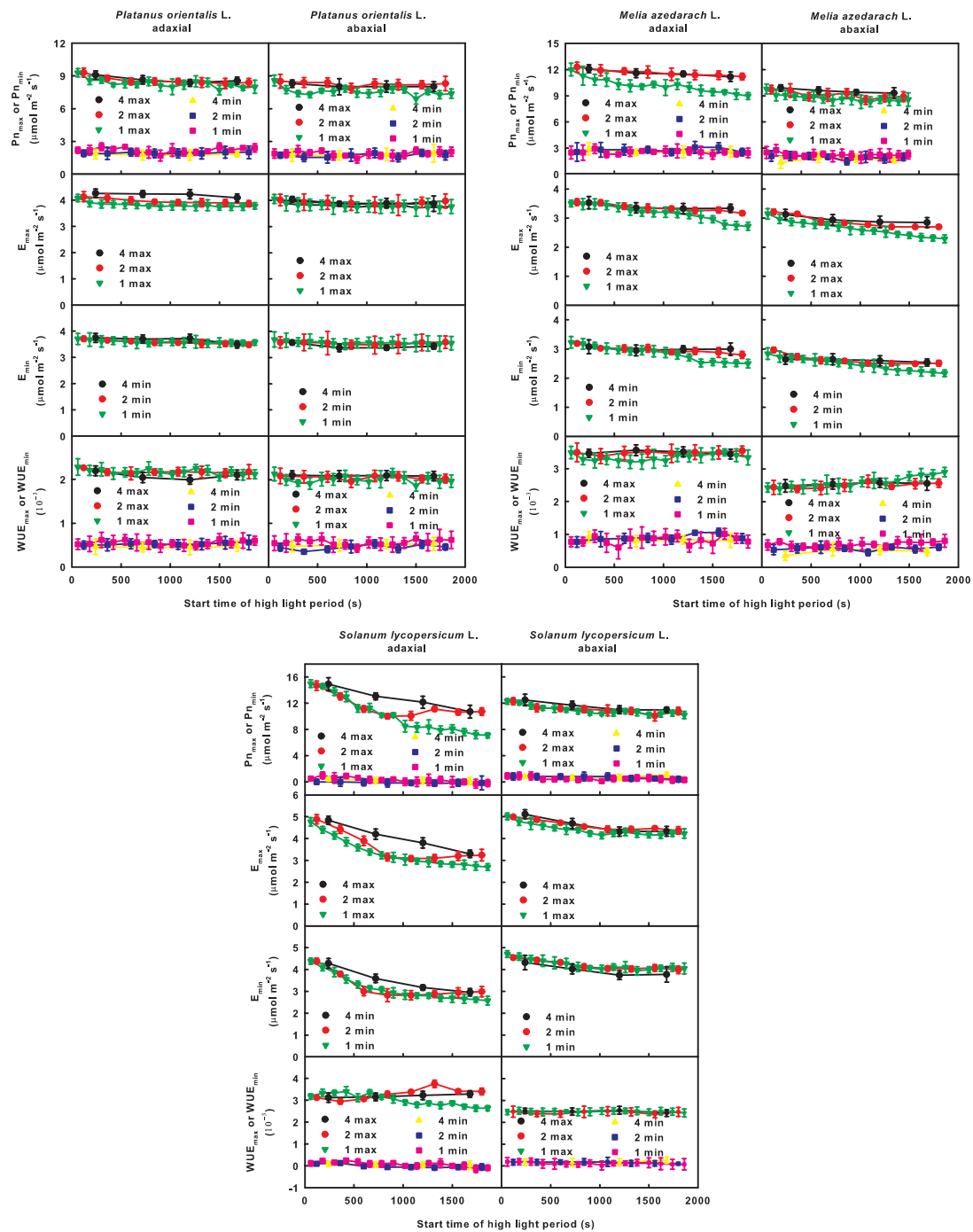
Supplementary Figure S1: The steady-state Pn, E, WUE and absorptance of the leaves that received irradiation from the adaxial or abaxial surface. The steady-state net photosynthetic rates (Pn_s ; a-c), transpiration rate (E_s ; d-f), water use efficiency (WUE_s , g-i) and absorptance to photosynthetic active radiation (400-700nm; abs; j-l) in leaves of *Platanus orientalis* L. (a, d, g, j), *Melia azedarach* L. (b, e, h, k) and *Solanum lycopersicum* L. (c, f, i, l) when either adaxial (ad) or abaxial (ab) surfaces of leaves were irradiated by $1,000 \mu\text{mol m}^{-2} \text{s}^{-1}$ light. Different letters indicate significant differences between adaxial and abaxial surfaces irradiation. Values are means (\pm SE), $n = 5$ (for Pn_s , E_s and WUE_s) or 15 (for abs).



Supplementary Figure S2: Time course of the transpiration rate and water use efficiency of leaves under simulated ad-ab-alt irradiation. Time course for the transpiration rate (E) and water use efficiency (WUE) in leaves of *Platanus orientalis* L., *Melia azedarach* L. and *Solanum lycopersicum* L. when the adaxial or abaxial surfaces of leaves were irradiated by fluctuating light, in which the irradiation was switched between high light ($1,000 \mu\text{mol m}^{-2} \text{s}^{-1}$) and low light ($100 \mu\text{mol m}^{-2} \text{s}^{-1}$) every 4 min or 2 min or 1 min.



Supplementary Figure S3: The maximum Pn, E and WUE during the high light period and the minimum E during the low light period under simulated ad-ab-alt irradiation. The maximum of net photosynthetic rate (Pn_{max}), transpiration rate (E_{max}) and water use efficiency (WUE_{max}) during the high light period of fluctuating irradiation, and the minimum of E (E_{min}) during the low light period of fluctuating irradiation. During measurement, the adaxial and abaxial surfaces of leaves from *Platanus orientalis* L., *Melia azedarach* L. and *Solanum lycopersicum* L. were irradiated by fluctuating light, in which the irradiation was switched between low light ($100 \mu\text{mol m}^{-2} \text{s}^{-1}$) and high light ($1,000 \mu\text{mol m}^{-2} \text{s}^{-1}$) every 4 min or 2 min or 1 min. Values are means (\pm SE), $n = 5$.



Supplementary Figure S4: The time required to reach 90% of the maximum transpiration rate (T_{90} of E) and water use efficiency (T_{90} of WUE) after the irradiation was shifted from low light to high light. During measurement, the adaxial and abaxial surfaces of leaves from *Platanus orientalis* L., *Melia azedarach* L. and *Solanum lycopersicum* L. were irradiated by fluctuating light, in which the irradiation was switched between high ($100 \mu\text{mol m}^{-2} \text{s}^{-1}$) and low light ($100 \mu\text{mol m}^{-2} \text{s}^{-1}$) every 4 min or 2 min or 1 min. Values are means (\pm SE), $n = 5$.

