Light-mediated Kleaf induction and contribution of both the PIP1s and PIP2s aquaporins in five tree species: walnut (Juglans regia) case study

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Résumé en anglais	Understanding the response of leaf hydraulic conductance (Kleaf) to light is a challenge in elucidating plant–water relationships. Recent data have shown that the effect of light on Kleaf is not systematically related to aquaporin regulation, leading to conflicting conclusions. Here we investigated the relationship between light, Kleaf, and aquaporin transcript levels in five tree species (Juglans regia L., Fagus sylvatica L., Quercus robur L., Salix alba L. and Populus tremula L.) grown in the same environmental conditions, but differing in their Kleaf responses to light. Moreover, the Kleaf was measured by two independent methods (high-pressure flow metre (HPFM) and evaporative flux method (EFM)) in the most (J. regia) and least (S. alba) responsive species and the transcript levels of aquaporins were analyzed in perfused and unperfused leaves. Here, we found that the light-induced Kleaf value was closely related to stronger expression of both the PIP1 and PIP2 aquaporin genes in walnut (J. regia), but to stimulation of PIP1 aquaporins alone in F. sylvatica and Q. robur. In walnut, all newly identified aquaporins were found to be upregulated in the light and downregulated in the dark, further supporting the relationship between the light-mediated induction of Kleaf and aquaporin expression in walnut. We also demonstrated that the Kleaf response to light was quality-dependent, Kleaf being 60% lower in the absence of blue light. This decrease in Kleaf was correlated with strong downregulation of three PIP2 aquaporins and of all the PIP1 aquaporins tested. These data support a relationship between light-mediated Kleaf regulation and the abundance of aquaporin transcripts in the walnut tree.
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