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ABSTRACT

Physiological characteristics of *Fagus sylvatica* and *Quercus robur* in response to extreme light environments

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Abstract

Broadleaf planting has become important in Ireland, with European beech (*Fagus sylvatica*) and pedunculate oak (*Quercus robur*) as two of the most popular species planted. We studied the physiological responses of four year-old oak and five year-old beech to full sunlight (100% of incident photosynthetically active radiation, PAR) and heavy shade (28% of incident PAR) in a shadehouse experiment during the summer of 2013.

Beech and oak exhibited different physiological responses when acclimatised to heavy shade, while they showed similar responses when were grown in full sunlight. Oak seedlings grown in heavy shade were better able to respond, as measured by photosynthesis rates, to increased incident light than beech seedlings. Oak seedlings generally showed greater values than beech seedlings in both light environments for the gas exchange (net photosynthesis, stomatal conductance, instantaneous water use efficiency and intrinsic water use efficiency) and fluorescence (photosystem II operating efficiency, photosystem II maximum efficiency, photochemical quenching and electron transport rate) parameters studied. For almost all of the gas exchange parameters explored during the study, beech seedlings exhibited greater physiological plasticity than oak seedlings in response to different light environments.