



# Altitude of origin influences the responses of PSII photochemistry to heat waves in European beech (*Fagus sylvatica* L.)<sup>☆</sup>

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## ABSTRACT

The photosynthetic responses to the combined effect of drought and heat stress were studied in leaves of 19-years-old European beech (*Fagus sylvatica* L.) trees originating from five provenances in Central Europe differing by altitude (55–1250 m), and grown in the same experimental plot. The measurements were conducted at the beginning of heat waves, under two different conditions: during a dry period (middle of July) and after recovery in wetter period, at the beginning of August. The decreases of stomatal conductance ( $g_s$ ) and net photosynthesis rate ( $A_{CO_2}$ ) during drought and heat wave stress were very similar in all provenances. However, we observed distinct response of PSII photochemistry on combined drought and high temperature stress, well associated with altitude of origin of the beech provenances. Measurements of pulse amplitude modulated (PAM) fluorescence identified maintenance of a high electron transport rate in beech provenances from high altitudes under drought and heat wave conditions, associated with some decrease of excitation pressure on PSII. This can be explained by enhanced capacity of alternative electron sinks to utilize the excess of electrons as a photoprotective mechanism. The analyses of fast chlorophyll fluorescence kinetics confirmed the differences in responses of PSII photochemistry between provenances originating from different altitudes. Compared with provenances at higher altitudes, we found more sensitive response (i.e. more limited electron transport at the PSII acceptor side and changes in the size of light harvesting complexes) to drought and heat stress, in those growing at low altitudes. Our results support the hypothesis that the provenances originating from higher altitudes possess enhanced phenotypic plasticity related to photoprotective responses, resulting from the long-term adaptation to marginal mountain conditions.

## 1. Introduction

! Celý článok je dostupný cez SLDK, vzdelený prístup SLDK alebo prostredníctvom školských počítačov TUZVO!

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