
LATE SUMMER-EARLY FALL PHOTOSYNTHESIS IN COTTONWOOD

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Photosynthesis was investigated during late summer and early fall in a population of mature cottonwood (*Populus deltoides*) trees growing on the campus of MSU-Billings in southcentral Montana. Parameters related to photosynthesis were measured in situ with a Licor 6400XT Photosynthesis system. A diurnal fluctuation in assimilation was observed with a peak value of $17.0 \mu\text{M m}^{-2} \text{ s}^{-1}$ CO₂ fixed during mid-day. We examined the capacity for assimilation at a PAR of $4000 \mu\text{M m}^{-2} \text{ s}^{-1}$ (approx. 200% full sunlight) and observed assimilation values as high as $17.6 \mu\text{M CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ with no indication of photoinhibition. *P.deltoides* also responded to high ambient CO₂ ($1600 \mu\text{mol M}^{-1}$) where assimilation increased to $31.5 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ under $1000 \mu\text{M m}^{-2} \text{ s}^{-1}$ PAR. We used an ACi curve fitting utility to obtain values of $104 \text{ mmol m}^{-2} \text{ s}^{-1}$, $117 \text{ mmol m}^{-2} \text{ s}^{-1}$ and $8.6 \text{ mmol m}^{-2} \text{ s}^{-1}$ for rubisco V_cmax, electron flow rate and triose phosphate utilization, respectively. Transpiration was $0.1\text{-}6.1 \text{ mmol m}^{-2} \text{ s}^{-1}$ and correlated with assimilation. Assimilation declined 37% from the earliest measurements on 23Sep to those taken on 15Oct. We conclude that photosynthesis continues in leaves of *P.deltoides* well into autumn despite shorter days and cooler temperatures, but with an adaptive response resulting in less CO₂ fixation. Leaves can photosynthetically fix carbon, presumably stored as reserve carbohydrates well into late fall before the onset of autumnal leaf senescence.