

Publication

The influence of species and growing conditions on the 18-O enrichment of leaf water and its impact on 'effective path length'

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The stable oxygen isotope ratio ($\delta(18)O$) of plant material has been shown to contain essential information on water and carbon fluxes at the plant and ecosystem scales. However, the effective path length ($L(m)$), a parameter introduced to leaf-water models still requires a comprehensive biological characterization to allow interpretation of $\delta(18)O$ values in plant material with confidence. Here, we tested the variability of $L(m)$ across and within three species that developed leaves in environments with different relative humidity. We also tested whether the $L(m)$ of fully developed leaves is affected by short-term fluctuations in relative humidity. We determined that significant differences in $L(m)$ exist among *Phaseolus vulgaris*, *Rizinus communis* and *Helianthus annuus*. Within a given species, however, $L(m)$ values did not differ significantly among individuals. These findings indicate that $L(m)$ is species specific and a relatively constant parameter and that $L(m)$ will not obscure the interpretation of $\delta(18)O$ values in plant material of a given species. We urge caution, however, because values for $L(m)$ are derived from fitting leaf-water models to measured values of $\delta(18)O$, so care must be taken in assigning a 'cause' to values of $L(m)$ as they likely capture a combination of different biological leaf properties.

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