Effects of leaf water evaporative 2H-enrichment and biosynthetic fractionation on leaf wax n-alkane δ2H values in C3 and C4 grasses

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Leaf wax n -alkane δ 2 H values carry important information about environmental and ecophysiological processes in plants. However, the physiological and biochemical drivers that shape leaf wax n -alkane δ 2 H values are not completely understood. It is particularly unclear why n -alkanes in grasses are typically 2 H-depleted compared with plants from other taxonomic groups such as dicotyledonous plants and why C3 grasses are 2 H-depleted compared with C4 grasses. To resolve these uncertainties, we quantified the effects of leaf water evaporative 2 H-enrichment and biosynthetic hydrogen isotope fractionation on n -alkane δ 2 H values for a range of C3 and C4 grasses grown in climate-controlled chambers. We found that only a fraction of leaf water evaporative 2 H-enrichment is imprinted on the leaf wax n -alkane δ 2 H values in grasses. This is interesting, as previous studies have shown in dicotyledonous plants a nearly complete transfer of this 2 H-enrichment to the n -alkane δ 2 H values. We thus infer that the typically observed 2 H-depletion of n -alkanes in grasses (as opposed to dicots) is because only a fraction of the leaf water evaporative 2 H-enrichment is imprinted on the δ 2 H values. Our experiments also show that differences in n -alkane δ 2 H values between C3 and C4 grasses are largely the result of systematic differences in biosynthetic fractionation between these two plant groups, which was on average $-$198L' and$-$159L' for C3 and C4 grasses, respectively.

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