

## Variable concentration and $\delta^2\text{H}$ values of *n*-alkanes in different organs of grasses from alpine and temperate grasslands

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Leaf wax *n*-alkanes are long chained hydrocarbons produced by terrestrial plants. Their hydrogen isotope ratios ( $\delta^2\text{H}$ ) have been used as a proxy for environmental and plant ecophysiological processes. Calibration studies designed to resolve the mechanisms that determine the  $\delta^2\text{H}$  values of *n*-alkanes have exclusively focused on *n*-alkanes derived from leaves. It is therefore unclear in which quantities *n*-alkanes are produced also by other plant organs such as roots or inflorescences. Moreover, there is insufficient information on the variability of *n*-alkane  $\delta^2\text{H}$  values in different plant organs.

To test these open questions, we sampled a total of 14 species of European C3 grasses in a temperate and an alpine grassland in Switzerland. The sampling period was in the spring-summer seasons to assure the presence of 5 main organs: Leaves, sheaths, stems, inflorescences and roots. Our data show similar *n*-alkane concentrations of leaves, stems and sheaths of the prevalent alkanes C29 and C31. In contrast, inflorescence had much higher of *n*-alkane concentrations than leaves and stems while roots had very low *n*-alkane concentrations. The  $\delta^2\text{H}$  values of leaves, sheaths and stems were slightly depleted compared to the overall mean  $\delta^2\text{H}$  values of a species. Most interestingly, however, inflorescences and roots show significantly more enriched  $\delta^2\text{H}$  values compared to *n*-alkane  $\delta^2\text{H}$  values of the other plant organs. The patterns we found were consistent for grasses from the temperate and the alpine site. Variable *n*-alkane  $\delta^2\text{H}$  values in different plant organs could be the result of different deuterium enrichment of biosynthetic water or differences in biosynthetic fractionation.

Our study brings new insights into the natural variability of *n*-alkane  $\delta^2\text{H}$  values and has implications for the interpretation of *n*-alkanes in paleohydrological research.