Abundance and distribution of leaf wax n-alkanes in leaves of Acacia and Eucalyptus trees along a strong humidity gradient in northern Australia

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Environmental parameters such as rainfall, temperature and relative humidity can affect the composition of higher plant leaf wax. The abundance and distribution of leaf wax biomarkers, such as long chain n-alkanes, in sedimentary archives have therefore been proposed as proxies reflecting climate change. However, a robust palaeoclimatic interpretation requires a thorough understanding of how environmental changes affect leaf wax n-alkane distributions in living plants. We have analysed the concentration and chain length distribution of leaf wax n-alkanes in Acacia and Eucalyptus species along a 1500 km climatic gradient in northern Australia that ranges from subtropical to arid. We show that aridity affected the concentration and distribution of n-alkanes for plants in both genera. For both Acacia and Eucalyptus n-alkane concentration increased by a factor of ten to the dry centre of Australia, reflecting the purpose of the wax in preventing water loss from the leaf. Furthermore, Acacian-alkanes decreased in average chain length (ACL) towards the arid centre of Australia, whereas Eucalyptus ACL increased under arid conditions. Our observations demonstrate that n-alkane concentration and distribution in leaf wax are sensitive to hydroclimatic conditions. These parameters could therefore potentially be employed in palaeorecords to estimate past environmental change. However, our finding of a distinct response of n-alkane ACL values to hydrological changes in different taxa also implies that the often assumed increase in ACL under drier conditions is not a robust feature for all plant species and genera and as such additional information about the prevalent vegetation are required when ACL values are used as a palaeoclimate proxy.

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