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Application of point-process statistical tools to stable isotopes in xylem water for the study of inter- and intra-specific interactions in water uptake patterns in a mixed stand of *Pinus halepensis* Mill. and *Quercus ilex* L.

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The stable isotope composition of xylem water reflects has been used to assess inter-specific differences in uptake patterns, revealing synergistic and competition processes in the use of water resources (see e.g. Dawson et al. 1993). However, there is a lack of detailed studies on spatial and temporal variability of inter- and intra-specific competition within forest stands. In this context, the aim of this work was to compare the isotope composition of xylem water (δ^{18}O , δ^{2}H) in two common Mediterranean tree species, *Quercus ilex L.* and *Pinus halepensis Mill*, in order to understand their water uptake patterns throughout the growing season. In addition, we analyze the spatial variability of xylem water, to get insight into inter-specific strategies employed to cope with drought and the interaction between the individuals. Our first hypothesis was that both species used different strategies to cope with drought by uptaking water at different depths; and our second hypothesis was that individual trees would behave in different manner according to the distance to their neighbours as well as to whether the neighbour is from one species or the other. The study was performed in a mixed stand where both species are nearly co-dominant, adding up to a total of 33 oaks and 77 pines (plot area= 893 m^2). We sampled sun-exposed branches of each tree six times over the growing season, and extracted the xylem water with a cryogenic trap. The isotopic composition of the water was determined using a Picarro Water Analizer L2130-i. Tree mapping for spatial analysis was done using a high resolution GPS technology (Trimble GeoExplorer 6000). For the spatial analysis, we used the pair-correlation function to study intra-specific tree configuration and the bivariate pair correlation function to analyse the inter-specific spatial configurations (Stoyan et al 1995). Moreover, the isotopic composition of xylem water was assumed to be a mark associated to each tree and analysed as a marked point pattern. Preliminary results showed significant differences between species, but only during drought periods, confirming our first hypothesis. For example, in late-summer and early-autumn, the values for *Q. Ilex* (δ^{18}O= -4.9 $\pm$0.3 permille, δ^{2}H=-53.5$\pm$1.2 permille) were significantly lower than for *P. halepensis* (δ^{18}O= -1.1$\pm$0.2 permille, δ^{2}H = -27.8$\pm$0.8 permille), pointing to the use of deeper soil layers by *Q. ilex*. On the other hand, point process analyses showed intra-specific interactions, whereas inter-specific interactions were not detected.

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