



## **Effects of fire temperature on leaf litter physical parameters and release of base cations of two Quercus suber plots, located in different forests of the Iberian Peninsula**

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*Quercus suber* (Q.S.) is a widely distributed tree species characteristic of the Mediterranean region. This species is very important for the forest industry because of the economic value of its bark and its adaptation to fire. However, this resilience depends on fire severity and the magnitude of these fire impacts is important for the recovery of Q.S. forests after fire. The physical and chemical properties of ash resulting from the burning of the forest floor are indicators of the severity of fire effects on the forest. The aim of this work is to observe the physical - Loss on Ignition (LOI %) and ash color - and chemical (Calcite, pH, Electrical Conductivity (EC), release of Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup> and K<sup>+</sup>) changes of leaf litter from two Q.S. plots exposed to 150°C, 200°C, 250°C, 300°C, 350°C, 400°C, 450°C, 500°C, and 550°C in a laboratory experiment. The Q.S. plots were located in different forests of the Iberian Peninsula, Albufeira (Alb) located in Sesimbra-Portugal and Mas Bassets (MB) located in Girona-Catalunya. The results show that LOI% continues to change for Q.S. Alb up 400°C and for Q.S. MB up to 450°C, thereafter the variations are not statistically significant. Comparing both species, the LOI % of Q.S Alb litter is at all temperatures higher than that of the Q.S. MB litter. Ash color at 150°C is brown, becoming reddish at 200-250°C and black at 300°C. After this temperature, grey ashes are identified and they become whiter at

higher temperatures. Calcite appears in the Q.S. Alb ash at 350°C and in Q.S. MB at 400°C, and shows a tendency to increase with higher temperatures. Nevertheless, the proportion is always higher in the Albufeira samples. The two locations show similar pH and EC up to 300°C. The EC values are low, about 1 mS/cm<sup>3</sup>. Above 300 °C, both values rise, mainly in the Q.S. Alb samples. The release of base cations shows a different behavior between the two locations according to the temperature. The release of Ca in both locations is not substantial at low fire temperatures (150-300°C), however it rises abruptly at 350-400°C for Q.S. MB, decreasing subsequently. For Q.S. Alb, an increase of Ca<sup>2+</sup> is especially high at 500°C. The Mg in solution shows a reduced solubility at low fire temperatures for both Q.S. locations. However, it increases exponentially at 350°C in Q.S. Alb followed by a reduction. The major dissolution of this ion in Q.S. Alb. is observed at 400°C. Na in Q.S. Alb also exhibits a reduced solubility at lower fire temperatures, but that rises abruptly at 350°C, and shows a reduction at higher temperatures. For Q.S. MB this rise continues up to 500°C, decreasing thereafter. The monovalent cation K demonstrates the same behavior as the other cations, a reduced solubilization at lower fire temperatures, increasing dramatically at 350°C for Q.S. Alb and 450°C for Q.S. MB. The Q.S. located in different forests respond differently when exposed to the same fire temperatures. At lower temperatures, these differences are not substantial. However, at medium and high temperatures, the behavior of the parameters is more heterogeneous and the impacts depend on the element under analysis. In general, the major impacts of fire temperature are more evident in the Q.S. Alb location.