



Effects of wildfires on ash Carbon, Nitrogen and C/N ratio in Mediterranean forests

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Carbon (C) and Nitrogen (N) are key nutrients in ecosystems health and the more affected by fire temperatures, because of their low temperatures of volatilization. After a wildfire, due higher temperatures reached, a great amount of C and N can be evacuated from the ecosystems and the percentage of C and N not vaporized is concentrated in ashes. Hence, the study of ash C and N is of major importance because will be linked with the capacity of ecosystem recuperation. The aim of this work is study the C, and C/N of three wildfires occurred in Mediterranean forests dominated by *Quercus suber* and *Pinus pinea* in Portugal. In the first wildfire, named "Quinta do Conde", we collected 30 samples, in the second, "Quinta da Areia", 32 samples and the third, "Casal do Sapo" 40 samples. To estimate the consequences of wildfires in the parameters in study, we collected several samples of unburned litter near burned areas, composed by the same vegetation. The results showed that wildfires induced in % of Total Carbon (%TC) ashes content a non significantly reduction in Quinta do Conde plot (at a $p<0,05$) and significantly in Quinta da Areia plot ($p<0,001$) and Casal do Sapo plot ($p<0,001$). In % of Total Nitrogen (%TN) ashes content we observed in Quinta do Conde plot a significant increase ($p<0,001$), a non significant decrease in Quinta da Areia plot (at a $p<0,05$) and a significant reduce in Casal do Sapo plot ($p<0,01$). The C/N ratio suffer a significant ($p<0,001$) reduction in Quinta do Conde and Quinta da Areia plots and at a $p<0,01$ in Casal do Sapo plot. In all parameters in study, wildfires induced a greater spatial variability, by the analysis of the Coefficient of Variation.

Our tests effectuated in laboratory with samples collected near wildfires occurrence and exposed to the temperature gradient (150°, 200°, 250°, 300°, 350°, 400°, 450°, 500°, 550°C) fit with the results obtained. With temperature gradient, we identified a decrease of %TC ash content of *Quercus suber* samples and a rise until the 300°C in *Pinus pinaster* samples decreasing thereafter especially after the 400°C. In %TN we identified a rise in both species reducing abruptly at 450°C. C/N ratio decrease importantly after the 150°C.

These results showed us that wildfires can have different effects C and N litter resources, depending on the severity and temperature reached. Crossing the results obtained in laboratory simulations with the samples collected in wildfires we will have an idea about the severity and temperature occurred in each wildfire. Overall, the lower severity were observed in Quinta do Conde plot and the higher in Casal do Sapo plot, being Quinta da Areia in a middle position. The C and N levels after a wildfire will determine the capacity of landscape recuperation and according the data obtained this will be higher in Quinta do Conde plot and lesser in Casal do Sapo plot. These hypothesis will be confirmed by field observation.

Keywords: Carbon, Nitrogen, C/N ratio, wildfires, ashes, Quinta do Conde, Quinta da Areia, Casal do Sapo, *Quercus suber*, *Pinus pinaster*, Laboratory simulations, Severity, Landscape recuperation.