ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN BURNT SOILS

INTRODUCTION
In recent years, Portugal and Spain have been among the European countries most affected by forest fires [1]. Beyond the immediate impacts, fires have subsequent environmental impacts, not only on fauna and flora but also on the climate [2]. Numerous harmful compounds are emitted, including Polycyclic Aromatic Hydrocarbons (PAHs). Formed during incomplete combustion of organic matter, PAHs are always found as a mixture of individual compounds, showing a very considerable persistence in the environment, with a high tendency to bioaccumulate. Of the more than 100, 16 are considered priority because they are more toxic, mutagenic and carcinogenic than the rest and deserve special attention due to the risks they can pose to human and other animal health. This work focuses on these compounds [2].

METHODS

1) Sampling
1.1) Collection of 11 soil samples from 2 different places and storage.

2) Sample preparation
2.1) Physico-chemical characterization: pH, humidity %, organic matter
2.2) Extraction of PAHs using the QuEChERS method.

3) Chromatographic analysis (HPLC-DAD-FLD)
3.1) PAH identification
3.2) PAH quantification

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RESULTS: CHEMICAL / PHYSICAL ANALYSIS

Table 1 – Results obtained in physico-chemical analyzes performed on soil samples from Forgoselo and Portela do Homem.

RESULTS: POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) – FORGOSELO

• The most found compounds appear to be of higher molecular weight, which are the most lipophilic and those who are degraded with more difficulty.

• Soil 3 has the highest number of different PAH probably because it is in an area formed in a small depression where there is an upwelling of the small groundwater channel and receives water from adjacent burned areas (burned 2-3 years ago).

• Soil 6, which was the one that burned the most intensely, has the highest total PAH concentration value, due mainly to the presence of acenaphthene (Acen).

RESULTS: POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) – PORTELA DO HOMEM

• Soil 8 and soil 10 are the ones with the highest PAH concentration values, with acenaphthene (Acen) being the compound that most contributes to this value.

• High molecular weight compounds are generally not detected in these soils.

CONCLUSION

Soil 3 was taken from an area that, despite not having suffered fires, receives water from areas burnt 2 or 3 years ago. The results suggest that fire releases PAHs and that these substances move easily into the environment. The concentration of PAHs in soils that suffered combustion (soil 6) is higher than the concentration of PAHs in soils that have not suffered combustion reaching, in the worst case, a total PAH content of about 1.28 µg/g. The impact that these substances have on the soil is still relatively unknown compared to studies related to impact on water or air. Further research on this subject is therefore of utmost importance, especially considering about the possibility of transfer directly to food products or the possibility of PAHs becoming even more toxic products.