CHEMICAL DIVERSITY OF SOIL LIPIDS REFLECTS SURROUNDING BIODIVERSITY IN A FRENCH PEATBOG

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**Introduction**

The spatial heterogeneity of molecular biomarkers preserved in soils and sediments, and their representativeness of the spatial distribution of the surrounding vegetation, are seldom taken into account in environmental or paleoenvironmental studies. Here we examine the distribution of lipids in peat soils in relation to their potential plant sources in the surroundings.

**Sampling Site**

La Guette peatland is located in Neuvy-sur-Barangeon (Sologne, Cher) in the French Centre Region (154 m a.s.l.; N 47°19’, E 2°16’). This site covers 25 ha and is a transitional fen (pH about 4-4.5). La Guette peatland is located in Neuvy-sur-Barangeon (Sologne, Cher) in the French Centre Region (154 m a.s.l.; N 47°19’, E 2°16’). This site covers 25 ha and is a transitional fen (pH about 4-4.5).

**Lipid Analyses**

About 5 g of soil or plant sample were sonicated with CH2Cl2 (3 x 10 min x15). Total extract was fractionated into neutral and acidic compounds using amorphous-bonded silica. Neutral fraction was separated into five fractions using a sequence of solvents of increasing polarity. Alcohol fractions were silylated (BSTFA). Acid fraction was methylated and then, silylated. Extracts were analysed by GC/MS.

**Specificity of biomarkers**

We first explored lipid compounds that could be specific for distinct vegetation by comparing molecular imprints in soils with those of the surrounding plants.

**Variability of molecular imprints in stations**

We then compared the distribution of these lipid classes among soil samples in stations under varying vegetation cover.

**Tree counting**

Around each station, trees were counted in concentric circles of increasing radius (1, 2, 3, 4 and 5 m, giving areas of 3.14, 12.6, 28.3, 50.3 and 78.5 m², respectively). Then, tree density (dDensity) and cover index (CI) were calculated.

**Conclusions**

- Pentacyclic triterpenyl acetates detected in *Erica tetralix* and *Calluna vulgaris* were found in high concentrations in open stations.
- Tricyclic diterpenes and methoxy-serratene detected in *Pinus sylvestris* were found in high concentrations in semi-close and close stations dominated by *Pinus sylvestris*.
- Betulin derivatives detected in Betula pendula were found in high amounts in semi-close and close stations dominated by *Betula pendula*.
- Non-specific compounds showed rather homogeneous distribution along the stations. Reversely, the spatial dispersion of specific compounds appears controlled by the surrounding vegetation.
- Concentration of *B. pendula* and *P. sylvestris* biomarkers in soils are well correlated with tree density when an area of 80 m is considered. Here, the influence zone achieved by comparing the correlation between biomarker concentration and tree density with the considered area of 80 m².
- Compounds determined as non specific showed rather homogeneous distributions along the stations. This implies that there is no evident relationship that can be established with the surrounding vegetation. Although some compounds belonging to n-alkanoic acids, pentacyclic triterpenols and triterpene ketones showed high potential for reflecting the surrounding vegetation, they were not specific enough taken as a group.
- Reversely, compounds supposedly specific, although less abundant, are more efficient. For example, outliers in methoxy-serratene and tricyclic diterpenes are those exhibiting the highest dp/sylves.
- For both *P. sylvestris* and *B. pendula*, our results indicate a strong relationship between the concentration of specific biomarkers in soils and tree density. This relationship is valid over an area of at least 80 m².