

## Diatom community development during an indoor maturation experiment using some Portuguese clayey material

<sup>a</sup>Quintela A, <sup>b</sup>Almeida S P F, <sup>a</sup>Terroso D, <sup>a</sup>Ferreira da Silva E, <sup>c</sup>Forjaz V, <sup>a</sup>Rocha F

Thermal muds are a mixture of clayey material with mineral water (maturation process). These muds have been used in ancient times and are still applied for therapeutic purposes. Therapeutic action is not only due to the heat sensation that leads to multiple reactions (vasodilatation, perspiration, stimulation of cardiac and respiratory frequency) but also due to the anti-inflammatory action and cation exchange between mud and skin. During the maturation process the mud is progressively colonized by microorganisms specially diatoms. The anti-inflammatory action of muds was attributed to a product of microorganism's metabolism, the sulfoglycolipids (6-sulfo- $\alpha$ -D-quinovosildiacilglicerol).

The aim of this research is to characterize diatom communities (with therapeutic properties already recognised) in muds submitted to maturation processes.

Two mud samples from São Miguel Island, Azores Archipelago, Portugal were collected in April 2010 and one sample from Porto Santo Island, Madeira Archipelago, Portugal. The biological sample was collect-

ed from the edge of a fumarole from São Miguel and was kept alive for laboratory mud inoculation. A second sub-sample was immediately preserved with formalin (10% final concentration) for posterior study. Samples were matured in tanks covered permanently by a layer of mineral water during 120 days at constant room temperature (20°C). Replicates were made from each mud sample and were submitted to different abiotic conditions (ambient light with or without bimonthly stirring procedures). Temperature and pH were measured in each sampling site and also in experimental tanks during the process. Periodic samples for microalgae identification were taken from the maturation tanks from the uppermost sediment layer at the beginning and at the end of the process. Mineralogical and chemical muds characterizations were performed before and after the maturation period. FRX analysis revealed that azorean samples are enriched in  $\text{SiO}_2$ ,  $\text{SO}_3$  and  $\text{K}_2\text{O}$  and Porto Santo mud has the highest values of  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{MnO}$ ,  $\text{MgO}$ ,  $\text{CaO}$  and  $\text{TiO}_2$ . Maturation water was bicarbonated-sodium type with higher content on Na (373.6  $\text{mg}\cdot\text{L}^{-1}$ ), Cl (156  $\text{mg}\cdot\text{L}^{-1}$ ), Si (137 $\text{mg}\cdot\text{L}^{-1}$ ),  $\text{SO}_4$  (35  $\text{mg}\cdot\text{L}^{-1}$ ) K

(32 mg.L<sup>-1</sup>) and Ca (16 mg.L<sup>-1</sup>) assessed by ICP-MS and ionic chromatography. The assemblages of diatoms were dominated by *Nitzschia* species both in inocula or on matured muds. The maturation process led to the development of only a few diatom taxa present in the inoculum used. All matured samples presented a decrease in diversity (Shannon Weaver Index) when compared to diatom assemblages of the inocula. Nevertheless, a slight increase in diversity was reached for the same light condition on muds submitted to stirring procedures. One sample from

São Miguel island didn't reveal diatom community development, the other sample from the same island was dominated by *Nitzschia* cf. *thermalis* var. *minor*. The mud sample from Porto Santo allowed the development mainly of *Nitzschia communis*.

<sup>a</sup> University of Aveiro, Department of Geosciences, GeoBioTec-Geobiosciences, Geotechnologies and Geoengineering Research Center, Campus Universitário de Santiago 3810-193 Aveiro, Portugal (anaquintela@ua.pt)

<sup>b</sup> University of Aveiro, Department of Biology, GeoBioTec-Geobiosciences, Geotechnologies and Geoengineering Research Center, Campus Universitário de Santiago 3810-193 Aveiro, Portugal

<sup>c</sup> University of Azores, GeoBioTec-Geobiosciences, Geotechnologies and Geoengineering Research Center /Volcanological Observatory of Azores, 9501-801 Ponta Delgada, Portugal