3.7 = ARCHEOBOTANICAL STUDY OF TRADITIONAL AGROECOSYSTEMS BASED ON SEM-EDX ANALYSIS OF BURIED PHYTOLITHS

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The FP7 Project "MEditerranean MOntainous LAndscapes: a historical approach to cultural heritage based on traditional agrosystems (MEMOLA)" (http://www.memolaproject.eu/it) is studying past landscapes using ancient soil horizons as archaeological records. The project aims at evaluating the biodiversity of no longer existing environments, in order to reconstruct the past agroecosystems. One of the approach used in the study consisted in the selective sampling of buried paleo-soil horizons for the search of "testimonials" or useful pedo-archaeological "indicators" that can tell something about past environments and peculiar ecosystems no longer present. To this purpose it was decided to start extracting phytoliths from soil samples analysing them. Phytoliths are produced in and between the cells of living plants (1). They consist of biogenic silica, also referred to as opal, namely a hydrated amorphous form of silica (SiO_2 nH_2O) formed by complex inorganic polymerization processes. Once the portion of the plant containing phytoliths dies, they are released in the environment due to the decomposition of the organic matter. In general, phytoliths are not transported over long distances because they are relatively "heavy" particles (as opposed to pollen, for instance). Depending on the type of activities carried out by the human group or individual, the natural input of phytoliths can be more or less important in the constitution of the sedimentary assemblage. All human activities leave behind plant organic matter and phytoliths. Phytoliths have different shapes and size and can often have taxonomical significance. They can therefore be good indicators of past vegetation cover and environmental conditions, providing evidence of vegetation change if studied in stratigraphical records. They could represent a first step to explore the biodiversity of recent and past- environments (2). Phytoliths were studied from buried and charred plant micro-particles, fragments of epidermal tissues, that were recovered during the soil sieving procedures (Figs 1, 2, 3). Samples were observed under a scanning electron microscope (SEM). SEM analyses were performed using, in Variable Pressure mode, at 20 keV, an EVO 50 Scanning Electron Microscope (Carl-Zeiss, Oxford, UK) fitted with detectors for both Electron Backscattered Diffraction (BSD) and Variable Pressure Secondary Electron Scanning (VPSE). VP-SEM permitted the observation of micro-sections of soil and sediments and powdery samples extracted and selected to contain phytoliths without metallisation. It therefore represented a non-destructive technique for MEMOLA pedo-archaeological studies, which allowed to preserve small samples for their further characterisation.

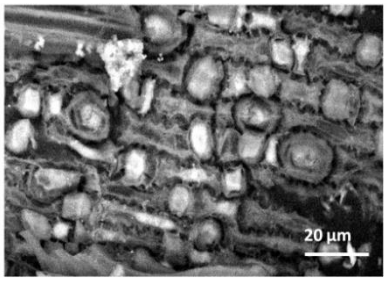

Fig. 1. SEM VP, BSD. Buried charred plant leaf fragment with phytoliths.

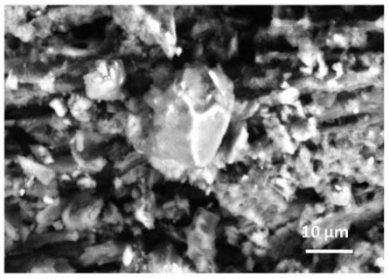

Fig. 2. A parallepipedal bulliform cell phytolith.

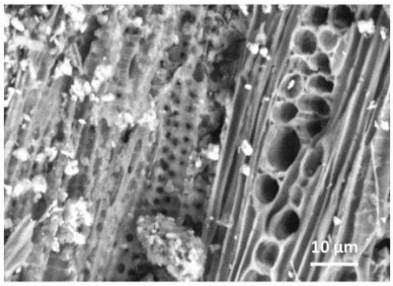

Fig. 3. SEM VP, BSD. Charred wood.

1) M. Madella, A. Alexandre, T. Ball (2005) Annals of Botany, 96, 253-260.
2) D.R. Piperno (2006) *Phytoliths: A Comprehensive Guide to Archaeologists and Paleoecologists*. Lanham, MD: Altamira Press.