

Wood anatomy microanalysis for dendrochronological and palaeoenvironmental reconstruction. Prehistoric woody plants from the southeast of the Iberian Peninsula

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Summary: *The prehistory of the southeastern Iberian Peninsula has a main question related to the palaeoenvironment: did argaric and chalcolithic populations overexploit the natural resources? The reconstruction is difficult given the complexity of plant growth in this geographical area. This paper offers a presentation of problems and solutions for archaeobotanical analysis.*

Key words: *charcoal analysis, dendrochronology, human impact, palaeoenvironment, prehistory.*

INTRODUCTION

At present, the most arid region in Europe corresponds to the southeast of the Iberian Peninsula. Large parts of its territory receive less than 300 mm rainfall annually. Nowadays, the remains of natural Mediterranean forest formations only survive on the highest and most marginal mountain ranges, while the Tertiary valleys present highly degraded environments.

In prehistoric times, 3rd and 2nd millennia BC, this territory experienced the emergence of one of the most developed societies in Europe, chronologically and socially distinguished between *Los Millares* (3rd millennium BC) and *El Argar* (2nd millennium BC). Discussion starts on the ability of these societies to transform the landscape in order to guarantee economic sustenance under arid conditions. A new way of resource exploitation caused several changes on the territory and, most important, the beginning of a non-resilient environmental situation.

The main objectives are:

- Understanding of the environmental consequences of different social, economic and political structures under severe aridity and fragile vegetation conditions.
- Studying of deforestation processes, plant exploitation and economic territories.
- Identifying climatic change episodes along the 3rd and 2nd millennia BC.
- Elaboration of the first dendrochronological framework based on charcoal remains from the later Prehistory.

DATA AND RESULTS

Mainly woody species under revision are: *Erica sp*, *Ficus carica*, *Olea europaea*, *Pinus nigra*, *Pinus sylvestris*, *Pistacia lentiscus*, *Pistacia terebinthus*, *Prunus sp.*, *Quercus coccifera*, *Quercus ilex*, *Quercus*

suber, *Rhamnus sp.*, *Rosmarinus officinalis* and *Tamarix* (Schweingruber, 1990; Schweingruber *et al.*, 2006).

The species are individually studied. First of all, it is needed to collect a minimum of 10 samples for each species under study. Each woody plant sample must contain stem, branches and shoots. Once the sample collection is completed, various slides are prepared to observe them on the microscope.

The purpose of this detailed review is to get the growth pattern for each species. Only in that case it will be possible to understand growth response. These differential growths will be registered on a database - through photographs and anatomic feature descriptions.

After the review, the determination on archaeobotanical material will take place. Those optimal samples - equal to highest number of tree rings per sample - will be measured and crossdated between them.

Thanks to the knowledge obtained, it will be able to discern growth patterns (basis for dendrochronology and palaeoenvironment reconstruction) of growth disturbances, and give more precise explanations to ecological changes and species particularities in every charcoal analysis from archaeological contexts.

DISCUSSION

During the last decades a series of hypothesis have been presented concerning the environmental changes and degradation during later Prehistory. A central aspect in the discussion has been the shift of environmental management from *Los Millares* to *El Argar*. Both societies had a very different relation towards natural resources, as well as a distinct social organization.

Shift from an intensive agriculture and diversified subsistence production during *Los Millares*, towards an

extensive monoculture based on barley cultivation on the Tertiary plains took place. This agricultural strategy would have resulted in deforestation of previously existing more or less open forest, basically composed by shrubs and underbrush (Castro *et al.*, 1996).

Management of wood resources provides crucial palaeoethnobotanical information. Wood is not used equally in all contexts, or during different phases. The plants used are a reflection of many environmental (Schweingruber, 1996) and social factors: climate, ecology, forest preservation, exploitation strategies and, most important, plant qualities and use knowledge (Badal, 1990; Carrión, 2005; Euba, 2008; Celma, unpublished).

CONCLUSIONS

It will be possible to ensure vegetation changes and overexploitation through the charcoal analysis from different settlement phases (Schoch and Schweingruber, 1982; Rodríguez-Ariza, 1992; Gale, 1999; Rodríguez-Ariza and Esquivel, 2005; Buxó and Piqué, 2008; García-Martínez *et al.*, 2008). Thanks to observation and description of tree rings on charcoal we could contribute to a better interpretation of its end and prove real consequences of climate in this society.

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