

Wood for fuel in Roman hypocaust baths: new data from the Late-Roman *villa* of Faragola (SE Italy)

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Summary: Archaeological excavations in the *villa* of Faragola brought back to light a complex system of hypocaust baths dated to the Late-Roman period. This finding, which represents one of the most important thermal complexes in southern Italy, offered the possibility to correlate the traditional study on the architectural characteristics with the analysis on charcoal remains. Results of radiocarbon dating define the chronological pattern of use, while anthracological analysis reveals an intentional pattern of wood exploitation

Keywords: Fuel, charcoal, hypocaust baths, Late-Roman, villa, South-Italy

INTRODUCTION

Traces of hypocaust are widespread all across the Roman Empire, but whereas the structure of these systems has been widely documented and several analyses were carried out to identify the way of functioning, very little is known about the wood used as fuel (McParland *et al.*, 2009).

Archaeological excavations in the *villa* of Faragola brought back to light a complex system of hypocaust baths dated to the Late-Roman period. This finding, which represents one of the most important thermal complexes in southern Italy, offered the possibility to correlate the traditional study on the architectural characteristics with the analysis on charcoal remains.

Investigations reveal that the plan extends over a vast area of more than 1000 square metres: a long corridor led to a room with a geometric mosaic which guaranteed access to a locker room and a huge room paved with a polychrome mosaic decoration for entertainment and gymnastic exercises (*apodyterium*). The route included a stop in the cold bathroom (*frigidarium*), with pools filled with cold water called *natatio*. From the *frigidarium* it was possible to move progressively towards the heated area, crossing the two *tepidaria*, the huge *caldarium*, and two *sudationes*, heated rooms used for massages and rest.

The hypocaust, which in Greek means ‘fire underneath’, provides the heat for the warm and hot rooms. The principle of such a system is that a furnace, or furnaces, are needed either to provide direct heat from burning (exhaust gases), or to heat water and generate steam. Furnaces were placed near *calidaria*, which had the floor popped up by cylindrical supports made of brick and limestone, called *pilae*. By covering the ground along the hypocaust system, flue gas arose from charcoal and/or wood burned in a furnace (*praefurnium*), which also provided heating of the bath. The water was heated in copper or bronze tanks above

the furnace combustion chamber. Hot flue gas would also heat up the water in the pool through *chimneys* placed at the corners of the room, which provided flue gas flow. Together with the heating through the ground, many baths were also heated through the walls by structural elements referred to as *tubuli*, which were usually made of brick (Basaran and Ilken, 1998)

Despite the great importance of fuel in such structures, little is known about the types of fuel used to fire Roman hypocaust furnaces. It is often stated that the fuel to feed the hypocaust would have been wood (Yegül, 1992), a hard wood (Blyth, 1999). However, it is also suggested that charcoal might have been used as it would have been easier to generate more heat (Rook, 1978, 1992, 1993).

The anthracological analyses of Faragola give information on the wood selection and the impact that the thermal system had on the local environment.

DATA AND RESULTS

Three different *praefurnia* (Amb. 36, 52, 48) were sampled and tree-branches were radiocarbon dated to get the correct chronological pattern of use. The section of the *praefurnium* of Amb. 36 was sampled and a young branch of *Quercus* deciduous was dated to 70-260 cal. AD (LTL4383A). Elements of the mosaic decoration limited the use of this first nucleus to the 2nd-3rd cent. AD. Microstratigraphical excavation was carried out on burned remains of the furnace of Amb.52 and several layers were identified. Residues of charcoals and ashes, resulting from cleaning, are buried under clay floors following a cyclical pattern. Two samples of oak (LTL 4382A and LTL 4381) limited the use of Amb.52 to the 4th-5th cent. AD.

The last radiocarbon measurement, obtained from a young branch of mastic tree from the furnace (Amb.48), dated the last thermal complex to the 5th-6th cent. AD (Fig.1).

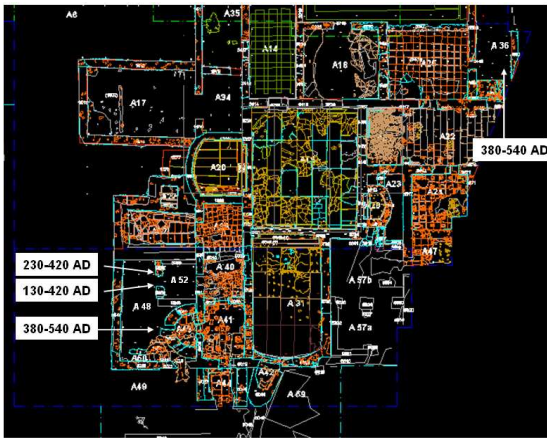


FIGURE 1: Map of the Faragola baths with spots on radiocarbon dates

The anthracological analysis was carried out on 1859 charred wood fragments collected in the three furnaces. Three taxa, *Quercus* deciduous, *Pistacia lentiscus* and *Rhamnus/Phillyrea* are ubiquitous, followed by *Sorbus* sp. and *Ulmus* sp. Few remains of *Quercus* type *ilex*, *Punica granatum*, *Populus/Salix*, *Acer* cf. *campestre*, *Olea europaea*, *Juniperus* sp., are also attested (see especially Amb. 52).

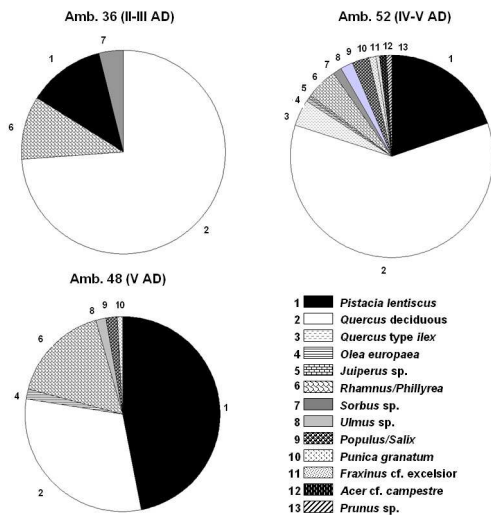


FIGURE 2: Percentages of wood species found in the praefurnia.

DISCUSSION

The study carried out on the fuel of the thermal complex represents only a small part of the larger anthracological investigation which took place in the Faragola site. The information provided by the archaeobotanical analysis regard both the Late-Roman villa and the Early Medieval settlement which spread over its ruins.

A complex system of exploitation of natural resources was pointed out and changes in the vegetal cover were hypothesised from the 2nd to the 7th cent. AD. At least three different catchment basins were identified: the coppice on the hill-top, the thermophilous wood in the sunny valleys, and the riparian vegetation

along the local streams. Fuel used in the hypocaust baths seems to come especially from the first area, where *Quercus* deciduous would have grown. Partially exploited was also the thermophilous wood where *Pistacia lentiscus* and *Rhamnus/Phillyrea* were collected. The impact that the human community had on the environment during the Late-Roman phase led to changes in wood supply during the following period. The employment of *Quercus* deciduous as fuel was limited to specialized activities, while minor essences were preferred for common use (Caracuta and Fiorentino, 2009).

CONCLUSION

The analysis of charred remains collected in three different praefurnia of the thermal complex of Faragola opens new perspectives in the study of hypocaust baths. Despite the long use of the system, from the 2nd to the 5th cent. AD, a strong continuity in wood selected for fuel can be seen. Different catchments were over-exploited until socio-political conjunctures signed the abandonment of the villa.

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