



Oil production in Roman times: residue analysis of the floors of an installation in Lecce (southern Italy)



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ABSTRACT

Installations for the production of oil and wine are key features for the understanding of ancient Mediterranean economy. The analysis of the organic residues preserved in the vats of production installations has been demonstrated to be a useful tool to identify their function. However, to better understand the spatial distribution of activities, the analysis of the residues preserved in the floors can be performed. In this study, we present the results of chemical analyses of samples taken from the vat and floors of a Roman production installation found in Lecce (southern Italy). The samples were analysed using spot tests aimed at identifying the presence of fatty acids and phosphates. The results of the analyses were plotted in a Geographic Information System (GIS) platform and interpolated with Inverse Distance Weighting (IDW) to determine the spatial distribution of the residues. A number of the samples were selected for analysis with gas chromatography – mass spectrometry (GC–MS) to better identify the origin of the fats. The chemical analysis of the residues confirmed the hypothesis that the installation was used for oil production. In one sample, castor oil was identified. This oil could be present either because it was produced there or because it was used in the oil mill for different reasons, possibly for lighting.

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1. Introduction

Liquid or semi-liquid substances released by human activities are absorbed by floors and can be studied to understand the activities that were performed in specific rooms and areas (Barba, 1986, 2007). Many investigations have been conducted in different parts of the world to identify the traces of human activities and to understand the use of space. These investigations have involved the study of different archaeological and ethnoarchaeological contexts, ranging from single rooms and buildings to entire regions, and are particularly useful when applied to plastered floors (Barba, 1986, 2007; Barba et al., 1995, 1996, 2014; Middleton and Price, 1996; Middleton et al., 2010; Ortiz and Barba, 1993; Pecci, 2009a, 2012, 2013; Pecci and Marazzi, 2005). Recently, residue analysis has been applied to the study of

installations for the production of oil and wine in Roman and Late Roman times, as they are sometimes difficult to distinguish (Brun, 2004; Pecci et al., 2013a; Peña Cervantes, 2010; Warnock, 2007). Ethnoarchaeological and archaeological studies have indicated that this aspect of archaeometry offers a good instrument for the interpretation of the function of these installations (Pecci, 2010, 2012; Pecci et al., 2013a).

In this paper, a further step in the investigation of chemical residues in production installations is achieved through the study of the floors and vat of a Roman installation that was found in Lecce (the Roman *Lupiae* in southern Italy) (Fig. 1). The objective of this research was to identify the substances produced in the installation, which was supposed to be used for oil production, and to understand the spatial distribution of the activities performed. A combination of spot tests and gas chromatography-mass spectrometry (GC–MS) analyses, which are particularly suitable for the identification of the traces of oils and wine (Middleton et al., 2010; Pecci et al., 2013a, 2013b), was used to study the samples.

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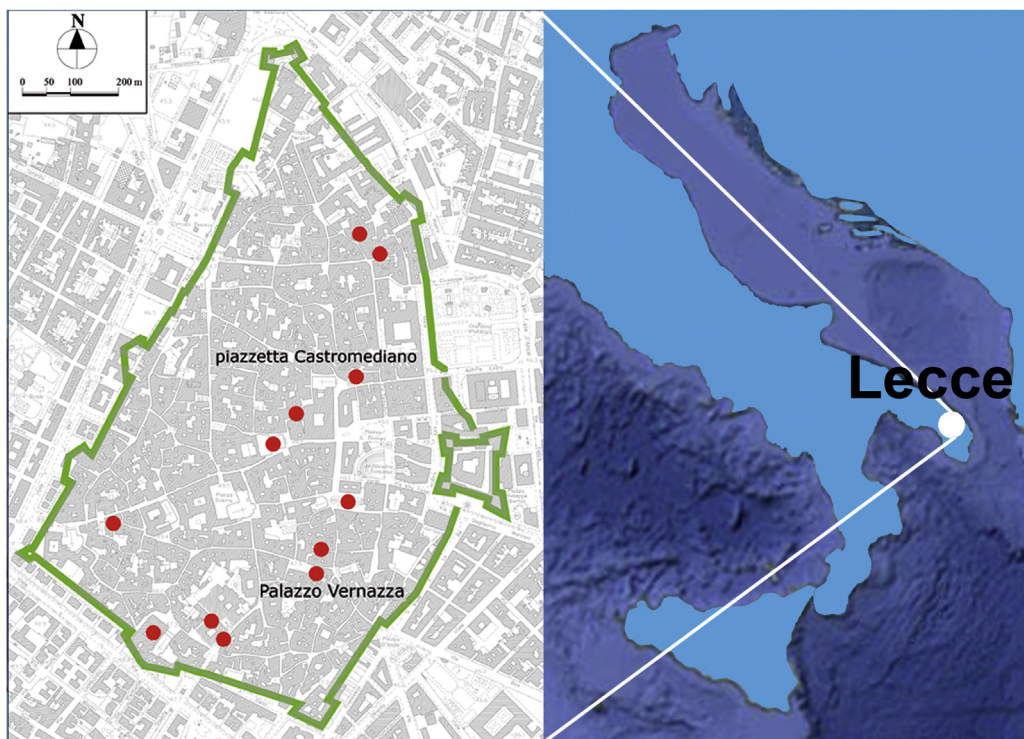


Fig. 1. Location of Lecce, the Roman *Lupiae*, and of Piazza Castromediano (modified from Polito, 2012, p. 179, Fig. 1).

2. The production installation

The installation was found in Piazza Castromediano in Lecce (D'Andria et al., 2005; Polito 2008, 2012) (Fig. 1). It dates back to the 1st century B.C. and was abandoned by the 4th century A.D. The hypothesis proposed by Prof. D'Andria, was that it was a *trapetum*, used for the production of olive oil. The installation would have been built during the period when the Salento region (the ancient *Calabria*, in southern Italy) was an important centre for the production of oil, which was exported all over the Mediterranean (D'Andria et al., 2005; Manacorda and Pallecchi, 2012). Traces of the presses were identified on the floor, while there were no traces of the mill, probably present in the installation, possibly due to the consequences of the re-uses of the area.

After ceasing production activities in the installation, the area continued to be used, as testified by the presence of ceramic fragments of the Late Roman in the dark earthen layer found above the floor. The Medieval occupation of the area produced holes in the Roman floor, and in the Late Middle Ages, a tannery was set up nearby (Figs. 2 and 3).

The Roman installation was formed by a vast room with a floor in *cocciopesto* (lime mixed with crushed ceramic and tiles), where two presses were located. Small channels carried the oil from the presses to a vat that was carved in the rock and coated with a *cocciopesto* layer. In the vat the substance produced in the installation was decanted. The vat was approximately 2.60 m deep with a circular hollow for collecting the sediment at the bottom and a small stair to enter the vat (Figs. 3 and 4) (Polito, 2008). The presence of these elements, the presses, the channels and the vat with the hollow at the bottom are typical of oil production installations (Brun, 2003, 2004; Peña Cervantes 2010; Warnock, 2007). However, samples were taken to verify this hypothesis and to analyse the spatial distribution of the activities performed.

3. Materials and methods

3.1. Materials

A total of fifty one samples were taken from different features of the installation. Thirty three samples were taken from the floor, following a grid of 1×1 m. However, it was not always possible to follow a regular grid, as it often happens in archaeology (Wells, 2010), due to the presence of later walls and holes produced during the Medieval occupation of the area. For sampling reasons, samples were named 1–19 and A–Z (Fig. 5). A restoring of the plaster of the floor was conducted in Ancient times. In the restored area, samples 8, 9, 19 and 20 were taken (Fig. 5). Seven samples were taken from the *cocciopesto* coating of the vat: two from the upper wall (1 and 2), two from the stairs (3 and 7) and three from the bottom of the vat (4, 5 and 6) (Table 1).

Finally, one sample was taken from the dark earth filling that covered the floor and analysed to understand if it was related with the leftovers of the production activities carried out in the installation and to verify the presence of post depositional contamination in the samples from the plastered floor (Table 1).

3.2. Methods

Samples were taken after cleaning the plastered surface. When the sampled surfaces were made of *cocciopesto* (broken ceramic sherds or tiles mixed with lime), only the lime portion was analysed, to avoid contamination eventually caused by the residues present in used ceramics.

All of the samples were ground to a fine powder and analysed using spot tests aimed at identifying fatty acids and phosphates. These spot tests were developed in Mexico (Barba, 2007; Barba et al., 1991) but nonetheless have provided good results in the analyses of activities conducted in the Mediterranean area (Middleton et al., 2010; Pecci, 2009a,b, 2013; Pecci et al., 2013b).

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