

TRACE ELEMENT ANALYSIS OF ARCHAEOLOGICAL ARTEFACTS FROM PELLA, JORDAN.

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Abstract

A brief history of the site at Pella, Jordan is presented, as a prelude to an analysis of the element composition of eighty two pottery sherds. Statistical results from this data support the archaeological evidence for occupation during the Late Bronze and Early Iron Age.

1. INTRODUCTION

This is a preliminary study of pottery from Pella, Jordan. The aim is to ascertain whether there were any significant changes in the quality and chemical composition of pottery during the Late Bronze and Early Iron Age periods. The study was undertaken by trace element analysis using PIXE/PIGME measurement of pelleted pottery samples, followed by non parametric statistical analysis. Some initial conclusions in support of archaeological evidence for continuous occupation during this period are presented.

2. THE SITE

Pella (in Arabic Fahl) is located on the eastern side of the Jordan Valley approximately 80 km northwest of the capital Amman and 10 km southeast of Beth-Shean. The identification of the site is based on the similarity between the modern and ancient names known from references in ancient texts, topographical and archaeological evidence.

The site of Pella occupies a unique position; strategically located near the intersections of a number of ancient roads. To the south of the mound lies the Wadi Jirm, a small alluvial valley where there once existed the springs for which Pella was famous [1]. Reference to Pella was made as early as the nineteenth century BC (The Egyptian Execration Texts). Indeed, excavation has revealed remains dating back to Neolithic times with occupation continuing almost without interruption until the Medieval Period [2].

Our period of interest is the transitional Late Bronze and Early Iron Ages (second half of the thirteenth and twelfth centuries BC). Unfortunately however, it appears that there are no ancient texts concerning Pella in the Iron Age, and indeed none until the Hellenistic Period.

It has been proposed by some that the absence of the name of Pella in the ancient literary sources of the Iron Age is the result of the city being destroyed by the Israelites, with reoccupation not occurring until Hellenistic times. Systematic excavation however, has shown that this theory is incorrect. There is a large body of archaeological material, particularly from the twelfth and eleventh centuries BC, revealing that Pella was occupied during part, if not all of the Iron Age.

There is evidence of a destruction at Pella in the early twelfth century BC. Occupation of the site however, appears to be continuous throughout the Late Bronze and Early Iron Age. Shape analysis of the various classes of pottery (cooking pots, jars, bowls) has shown this to be the case. Many of the Iron Age forms were derived from earlier Late Bronze Age traditions.

PIXE/PICME analysis has been employed in an attempt to see whether it is possible to differentiate between material of the two periods. Similarity of chemical composition for artefacts belonging to the two different periods will provide supporting evidence for continuous occupation during the Late Bronze and Early Iron Age. Eighty two sherds from cooking pot vessels were analysed.

3. EXPERIMENTAL METHOD

Pieces weighing approximately 200 to 300 mg were removed from the sherds for analysis. After the surface was removed by abrasion the samples were ground in a tungsten carbide mill and then mixed with ruthenium spiked graphite in a weight ratio of 10 percent graphite and 90 percent sample. Graphite was added for two reasons: firstly to overcome problems with charging and secondly to provide an internal standard. After mixing the samples were pressed into pellets suitable for analysis. All measurements were made following the procedure and facilities outlined by Duerden et al[3]. The PICME technique yielded results for Na, Mg, Al, F and Li. PIXE gave data for Si, K, Ca, Ti, Mn, Fe, Cu, Zn, Ga, Rb, Sr, Y, Zr and Pb. Because of possible interference by tungsten from the mill the results for Cu and Zn were not used. A data file containing concentration data for the elements listed above was generated as input to a number of statistical programs which were used to study the provenance of the pottery sherds.

4. DISCUSSION

Principal Components Analysis (PCA) and Cluster Analysis have been used in our study. As indicated in Figure 1 the pottery samples appear to be relatively homogeneous. The various sub-groups which can be deduced from PCA and cluster analysis using the Group Average method on data from Mean Character Differences showed that there was essentially no differentiation between the pre and post destruction phases from the site. We feel that our trace element analysis on these pottery artefacts provide supporting evidence for the theory of continuous occupation of the site during the Late Bronze and Early Iron Age periods. We do, however, stress that the results presented here are preliminary.

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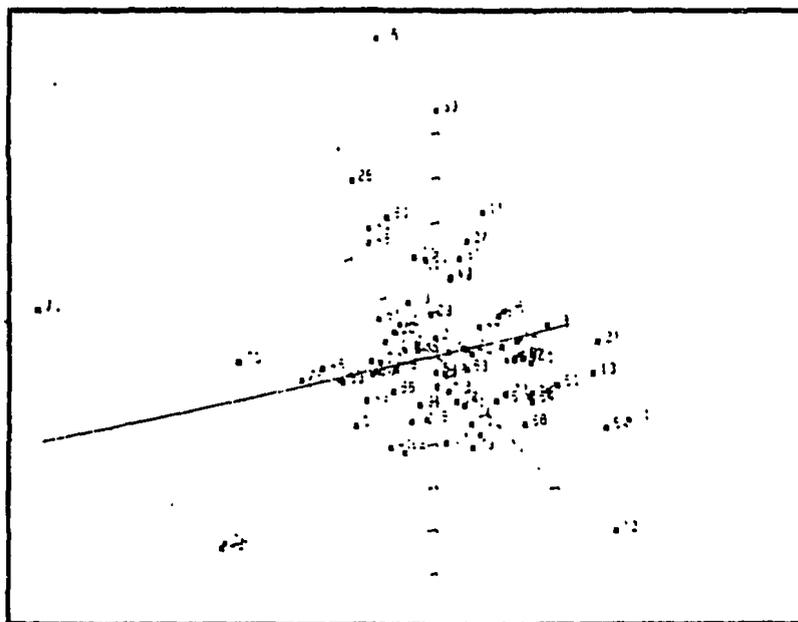


Figure 1. Principal Components Analysis showing the relative homogeneity of the sherds