CERAMIC PRODUCTION TRADITIONS IN THE LATE BYZANTINE–EARLY ISLAMIC TRANSITION: A COMPARATIVE ANALYTICAL STUDY OF CERAMICS FROM *PALAESTINA TERTIA*

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Abstract: *This article concentrates on ceramic production and trade during the transitional, late Byzantine–early Islamic period (6th–9th centuries AD) in Palaestina Tertia (southern areas of Israel and Jordan), and examines the way the political transition is associated with various socio-economic changes affecting the material culture traditions. ED-XRF bulk compositional analyses were carried out on transitional period ceramics from Jabal Harûn, Khirbet edh-Dharih, 'Aqaba, Elusa and Abu Matar in Beersheva. The results show that, despite the absence of direct evidence for post-Byzantine pottery kilns, local ceramic production continued in the transitional period, but some of the sites probably also shared production or exchanged cooking utensils. In addition, containers such as the 'Aqaba-amphorae have a wide distribution in the region, attesting to long-distance inland trade.*

Keywords: *Palaestina Tertia, Byzantine–Umayyad ceramics, ED-XRF, SEM-EDS*

INTRODUCTION

Historical context

This paper summarises some results of an ongoing project concentrating on the production, trade and distribution of ceramic artefacts during the transitional, late Byzantine–early Islamic period (6th–9th centuries AD) in southern Transjordan and the Negev. In the Byzantine period, these areas belonged to the same administrative unit, the province of *Palaestina Tertia*, until the Muslim invasion in ca. AD 630. The Muslim invasion marks the beginning of the slow abandonment of some of the once flourishing, agriculture-based Byzantine towns in the area, although local economies were affected by economic stagnation and changed trade routes already prior to the 630s *(Fiema 2001: 427–32; Rosen 2000: 48, 52–53; Schick 1995: 96–97; King 1992; King et al. 1989: 208)*. The political change from a Byzantine province into a relatively remote area of the early Umayyad empire, is, however, also associated with other drastic changes, such as the change of the dominant religion, a new ruling class and the introduction of new people and customs into the area, affecting the overall socio-economic situation of which we currently know very little. To what extent did these changes affect economic activities in general, and pottery production and trade in particular, or to reverse the question, can pottery inform us about the changes in local economies and their interaction? Additionally, this study seeks to establish whether local economies and pottery production survived the political transition, whether there was any exchange of material culture across the region, and whether certain stylistic traits could be related to specific workshops.

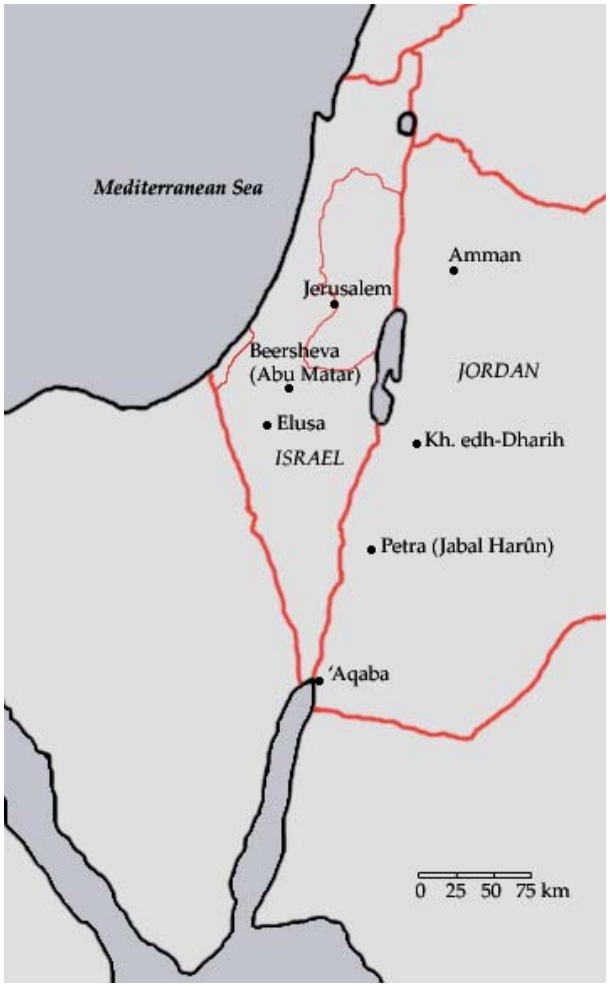

Fig. 1 Map showing the locations of the archaeological sites (by V.E. Holmqvist)

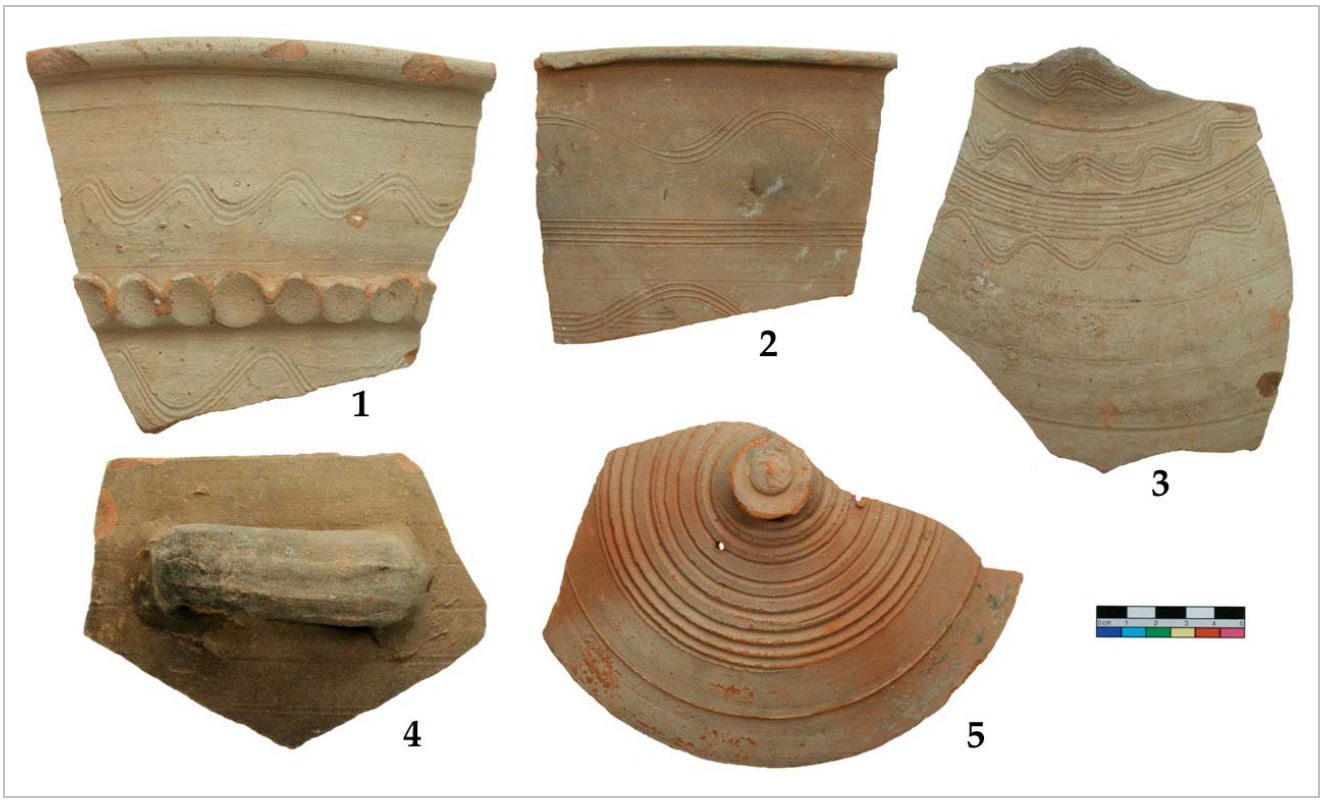

Fig. 2 Transitional, late Byzantine–early Islamic period ceramics from Jabal Harûn, near Petra. These examples belong to the Jabal Harûn main compositional group. Nos. 1–2: large basins with incised and applied decoration; no 3: jar shoulder fragment with incised decoration; no 4: open-form cooking pot with grooved exterior and a horizontal handle; no 5: cooking pot lid with a knob and grooved exterior (photo V.E. Holmqvist).

Analytical methods and archaeological materials

The archaeological sites (see **Fig. 1**) from which ceramic artefacts were analysed include the monastery of Jabal Harûn (near Petra), the village site of Khirbet edh-Dharih in southern Jordan, the port city of ʻAqaba/Aila on the Red Sea coast, the city of Elusa in the Negev and the farmhouse site of Abu Matar in Beersheva (for excavation reports, see, for example, *Frösén et al. 2004; Villeneuve 1990; Parker 2003; Goldfus & Fabian 2000; Gilead et al. 1994*). These sites represent rural, urban, and religious sites, thus covering different socio-economic contexts across the area of the former Byzantine province. The ceramic samples include mainly coarse ware ceramics: cooking pots, basins, jars, food/liquid containers and tiles (see **Fig. 2** for examples).

The project as a whole has involved a large-scale typological study prior to sample selection, and analytical approaches combining petrography, SEM-EDS, and ED-XRF, in order to discern specific technological aspects (see *Holmqvist, forthcoming*). However, this article will concentrate on the distribution of compositional groups and related archaeological aspects.

Bulk chemical compositions were obtained for 141 sherds from the sites, with samples prepared as pressed powder pellets and analysed using a polarising, energy-dispersive Spectro Lab XPro 2000 instrument. Each pellet was analysed three times, and the average values were then processed using multivariate statistics. The oxides included in the principal component analysis are MgO, Al_2O_3, SiO_2, K_2O, CaO, TiO_2, MnO, ZnO, SrO, ZrO_2, BaO. This compositional information was contrasted with results from petrography and SEM-EDS.

RESULTS

The PCA plot of ED-XRF data (**Fig. 3**) shows that the majority of the pottery recovered at each site falls into a distinct chemical region, which strongly suggests that all of them had their own supply of pottery, most likely at the local level. The limited number of trace elements detectable by ED-XRF prevents a definite provenance attribution for each of these. However, the consistency of the composition and petrography within each of these groups is strongly indicative of distinct pottery-making recipes which were probably local to each site.

		Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	MnO	Fe_2O_3	NiO	ZnO	SrO	ZrO_2	BaO
		%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm
Group 1	Mean (n=18)	0.48	2.16	22.96	62.28	0.14	1.97	1.86	0.85	0.03	6.77	43	72	116	247	129
	Std. dev	0.27	0.61	1.61	1.72	0.05	0.25	1.36	0.06	0.01	0.62	5	11	28	46	16
Group 2	Mean (n=14)	0.40	2.86	20.32	58.65	0.27	2.54	6.26	0.76	0.06	7.61	51	99	357	175	184
	Std. dev	0.22	0.95	2.35	3.00	0.11	0.43	3.53	0.09	0.02	0.88	10	41	134	52	94
Group 3	Mean (n=13)	2.09	3.16	18.23	53.85	0.32	2.05	12.78	0.63	0.09	5.91	43	126	682	160	458
	Std. dev	0.58	1.03	1.12	2.54	0.06	0.40	1.94	0.06	0.02	0.64	6	10	161	21	55
Group 4	Mean (n=10)	1.68	3.05	12.26	57.13	0.23	1.70	16.43	0.76	0.11	6.16	54	106	693	303	562
	Std. dev	0.50	0.36	0.85	3.97	0.05	0.24	2.99	0.07	0.01	0.44	3	5	113	33	64
Group 5	Mean (n=4)	1.23	2.26	12.76	53.23	0.86	1.36	21.24	0.71	0.10	5.84	86	156	1108	338	1116
	Std. dev	0.45	0.84	0.70	3.36	0.62	0.40	3.89	0.04	0.02	0.35	30	55	318	69	268
Group 6	Mean (n=9)	0.80	1.41	16.80	68.19	0.11	1.36	0.87	1.06	0.14	8.92	68	133	206	258	424
	Std. dev	0.27	0.11	1.18	2.25	0.03	0.12	0.10	0.08	0.03	0.77	7	15	28	14	79
Certified reference materials																
SARM 69 SACCRM Ceramic-1		0.79	1.85	14.40	66.60	0.28	1.96	2.37	0.78	0.13	7.18	53	68	109		600
Measured values		0.56	1.59	18.47	65.91	0.30	1.87	2.10	0.63	0.14	8.31	46	76	122		540
ECRM 776-1 Firebrick		0.49	0.48	29.29	62.77	0.06	2.92	0.31	1.62	0.00	1.43					1220
Measured values		0.55	0.45	32.48	60.40	0.06	2.54	0.27	1.34	0.01	1.66					1200
NIST 76a Burnt Refractory		0.07	0.52	38.70	54.90	0.12	1.33	0.22	2.03	0.00	1.60			370		
Measured values		0.48	0.64	42.02	51.69	0.12	1.20	0.18	1.64	0.01	1.84			402		
USGS BHVO-2 Basalt Hawaian Volcanic		2.22	7.23	13.50	49.90	0.27	0.52	11.40	2.73	0.17	12.30	119		389		130
Measured values		2.51	4.81	16.41	48.69	0.19	0.46	10.35	2.14	0.19	13.97	146		510		134

Table 1 ED-XRF data: Group averages and standard deviations (n=number of samples), and measured certified reference materials. All analytical results are averages of three measurements normalised to 100%.

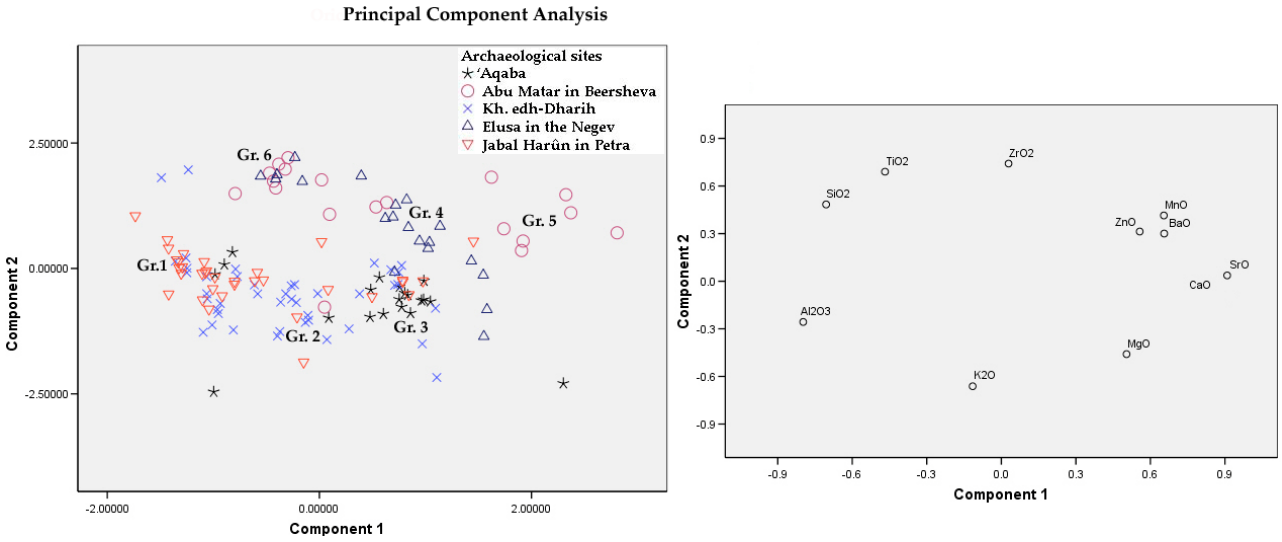

Fig. 3 Principal component analysis plot of the ED-XRF data. Group 1: the Jabal Harûn main group; Group 2: the Khirbet edh-Dharih main group; Group 3: the 'Aqaba main group, clusters together with amphora sherds from Jabal Harûn, Khirbet edh-Dharih and Elusa; Group 4: the Elusa local group, including kiln wasters; Group 5: group of Abu Matar samples; Group 6: the Negev cooking pot group, including cooking pots from Elusa and Abu Matar.

In the case of the Jabal Harûn ceramics, this main group (see Group 1 in **Fig. 3** and **Table 1**) was manufactured from a non-calcareous clay containing quartz, ilmenite, clay pellets and iron oxides. This main group includes the vast majority of the samples analysed from the monastery site of Jabal Harûn, including roof tiles; thus it can be considered to be local to the Petra area.

In comparison, the XRF results of the 'Aqaba ceramics show that the majority of the 'Aqaba samples were made from a calcareous clay (Group 3 in **Fig. 3** and **Table 1**). The predominant mineral inclusions in these ceramics are quartz, potassium-feldspar, alkaline feldspars, biotite mica, augite, and iron oxides. There is, however, an overlap of Jabal Harûn ceramics in the 'Aqaba field, and vice versa, suggesting material exchange between the

sites. The samples analysed from ‘Aqaba include the so-called ‘Aqaba/Aila-amphorae that are known to have been produced locally in ‘Aqaba at least until the 7th century AD (*Melkawi et al. 1994*). Likewise, the Jabal Harûn sherds that cluster with the local ‘Aqaba group are amphora sherds. It is thus clear that amphorae originating from the port of ‘Aqaba were transported to Petra and to Jabal Harûn, probably for their contents, such as fish products. Perhaps more intriguing is the possible flow of ceramics in the opposite direction, i.e., pottery transported from the Petra area to ‘Aqaba, especially as we can now illustrate that all these samples are from cooking vessels.

Similar results can be seen in the case of Khirbet edh-Dharih. Although the clay chemistry is similar to that of Jabal Harûn, probably resulting from a relatively homogeneous regional geology, there appears to be a distinct compositional group (Group 2 in **Fig. 3** and **Table 1**) with some outliers, some of which cluster with the Jabal Harûn and ‘Aqaba local groups, illustrating material exchange between the sites. It is particularly interesting that some amphora sherds found in Dharih proved to be ‘Aqaba-amphorae. Khirbet edh-Dharih, located almost 200 km north of ‘Aqaba, is the northernmost location where these amphorae have been found so far. Furthermore, we can again see indications of a shared producer of cooking vessels between Khirbet edh-Dharih and the Petra region. The mineralogy of the Khirbet edh-Dharih main group shows quartz, apatite, ilmenite, clay pellets and iron oxides in a calcareous ceramic matrix (with CaO values of ca 15 wt%).

If we compare these results with the data from the Negev sites, Elusa and Abu Matar in Beersheva (see Groups 4, 5 and 6 in **Fig. 3** and **Table 1**), the first aspect to be noted is the paucity of material exchange between the areas of southern Transjordan and the Negev. In the case of Elusa, where a ceramic workshop of Byzantine date was excavated, ceramic compositions split into two main groups: the first group (Group 4 in **Fig. 3** and **Table 1**), which includes all the analysed ceramic wasters and other ceramics, but excludes cooking vessels, is composed of calcareous clay; the other group (Group 6), comprising solely cooking-pot sherds, is of non-calcareous clay. When compared to the Abu Matar ceramics from Beersheva, it is clear that the Elusa and Abu Matar cooking pots cluster together (Group 6), indicating that these two sites shared cooking pot production or purchased them from the same market. The same source of the cooking pots from these two sites is supported by the petrographic and SEM-EDS data: besides the consistently similar composition of the ceramic matrices, these cooking pots were the only analysed samples that systematically included Mn-rich pellets. Although there is no match between these cooking pots and the kiln wasters from Elusa, we cannot, at the moment, say with certainty where the pots were produced, and further research is required to examine this phenomenon. If we look at the overall picture provided by the ED-XRF results, at least according to this evidence, there seems to be comparatively less interaction between the areas of southern Transjordan and the Negev, although there are some examples of exchange between these areas as well.

CONCLUSIONS

Although much work remains to be done, the results briefly outlined here allow some inferences to be drawn:

First, although we currently have no direct evidence of local ceramic production at any of the sites in the post-Byzantine era, the existence of one compositional main group at each of the sites allows us to suggest that these main groups are local to the sites in question. The transitional period ceramics sampled for this study are relatively high-quality common ware utensils, which indicate a rather well-established form of local pottery technology. In general, this evidence also argues for some urban continuation in the area, including continuation of local technologies, at least until the 8th century AD.

Secondly, this study offers evidence of material exchange in the area. The ‘Aqaba-amphorae were transported as far inland as Khirbet edh-Dharih in Transjordan and Elusa in the Negev. In addition to the transport of food/liquid containers, it is of particular interest that some of the sites in each region, Jabal Harûn, Khirbet edh-Dharih and ’Aqaba on the one hand, and Elusa and Beersheva on the other, shared, at least to some extent, a producer of cooking vessels. This kind of evidence has been lacking concerning the transitional–early Umayyad period, particularly in the southern areas.

Finally, if we go further beyond the borders of *Palaestina Tertia* and look at the overall picture of the transitional–early Islamic pottery in the area of modern Israel and Jordan, it is worth noting that the wide area shares similarities in ceramic style. Although there are some features that seem to be specific to a certain area or workshop, it seems that, in general, local potters adapted in similar ways to many new stylistic influences, including new vessel forms, such as large basins and certain jar forms, which were introduced in the course of the transitional period. As a case in point, similar forms and styles are present at the different sites covered by this study, but compositional data reveals that, by and large, they were made in different workshops. This highlights the need to go beyond stylistic comparisons, and study ceramic style alongside ceramic provenance and technology.

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