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A Microscopic Examination of Fresh Breaks of Selected Roman-Period Potsherds from Naṣr ed-Din, near Tiberias

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The microscopic examination of the fresh breaks of selected Roman-period pottery vessels from the excavation at Naṣr ed-Din aimed at identifying their possible provenance. The examination revealed seven fabric groups, each of which was correlated with pottery production sites in Galilee. Furthermore, the examined vessels demonstrate a noticeable relationship between form and fabric.

Keywords: Galilee, Roman period, pottery fabric, microscopic examination, provenance, pottery workshops

Introduction

Eighteen pottery vessels from the excavation at Naṣr ed-Din (see Avshalom-Gorni, Leibner and Ben Nahum, this volume)—seventeen dating to the Roman period and one to the Hellenistic period (Table 1)—were selected by the director of the excavation for a more detailed fabric examination, with the aim of determining their provenance. Due to budget constraints, the fabric of the potsherds was not analyzed by petrography, but their fresh breaks were examined under a binocular microscope at magnifications of ×20 to ×40, with the aid of 5% dilute hydrochloric acid, white streak plate (unglazed porcelain plate) and a steel needle. Such an examination provides the mineralogical and technological data of the matrix and the non-plastic inclusions within the sherd, such as mineral sand and imprints of organic matter, providing similar data to the petrography analysis, albeit on a lower resolution. Firing temperature and conditions were roughly estimated according to the sherds' color and hardness, and the state of carbonate minerals, when present. The lithology of the examined samples was compared to that of other pottery finds from the region, which were studied by both mentioned methods.

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RESULTS

The samples were divided into seven fabric groups (Table 1), relating to six possible provenances (Avshalom-Gorni, Leibner and Ben Nahum, this volume: Fig. 1). These fabric groups are described below in geographical order pertaining to their distance from the site, starting with apparent local production sites and followed by farther destinations.

Group 1: Tiberias A. This group includes three storage jars (Table 1: Nos. 9, 11, 13) characterized by a light greenish gray fabric. Their matrix is calcareous and foraminiferous marl, containing minute specks of iron oxides, and apparently, basalt-derived minerals. Sand-sized (0.1−0.9 mm), non-plastic inclusions are rare and comprise subrounded quartz, basalt and floury chalk, or decomposed limestone (Figs. 1, 2). The firing temperature was estimated at c. 750ºC for sample No. 9 and c. 800−850ºC for sample Nos. 11 and 13 that seemed more vitrified.

Table 1. Fabric Groups of the Naṣr ed-Din Pottery

Fabric Group and Provenance	Sample No.	Vessel	Locus	Basket	Fig.	Fig. in Avshalom-Gorni, Leibner and Ben Nahum, this volume	Distance from Site (km)
Group 1: Tiberias A	9	Storage jar	226	1625	2	29:8	0−5
	11	Storage jar	249	1775	1	29:5	
	13	Storage jar	216	1782		29:7	
Group 2: Tiberias B	10	Basin	217	1740	3	25:1	0–5
Group 3: Naḥal Ẓalmon	8	Storage jar	129	1087	4	29:3	9−10
Group 4: Karm er-Ras	1	Storage jar	131	1144	5	28:4	18−19
	2	Storage jar	174	1206		29:1	
	3	Storage jar	162	1237		28:6	
	5	Storage jar	183	1290		28:1	
	6	Storage jar	185	1345		28:5	
	12	Storage jar	249	1778/2		29:5	
	16	Storage jar	263	1875		29:6	
	18	Storage jar	241	1950		29:4	
Group 5: Kefar Ḥananiya	7	Cooking pot	191	1390	6	26:3	18−19
	17	Cooking bowl	216	1906		24:5	
Group 6: Shiḥin	4	Storage jar	171	1262		28:2	23−24
	15	Shiḥin bowl	253	1896	7	24:9	
Group 7: Western Galilee	14	Storage jar (bulb)	249	1789	8	23:2	15−30

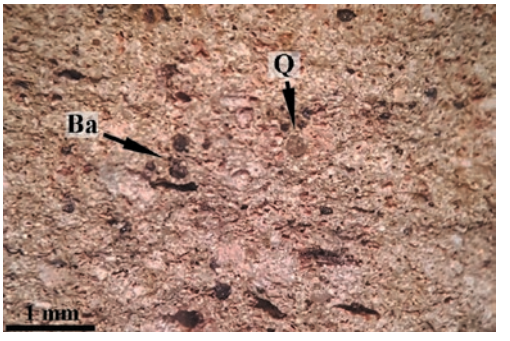

Fig. 1. Photomicrograph of the fresh break of Sample 11 (Q = quartz, Ba = basalt).

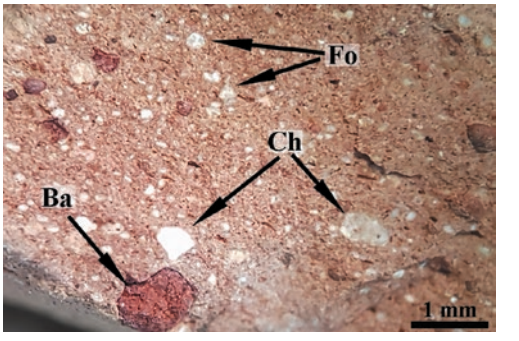

Fig. 2. Photomicrograph of the fresh break of Sample 9 (Ba = basalt, Ch = chalk, Fo = foraminifera).

Group 2: Tiberias B. This group includes one basin (Table 1: No. 10)—a porous, light brown sherd with a thick gray core. Its matrix is calcareous and slightly foraminiferous. The sand-sized, non-plastic inclusions comprise rounded grains of eroded basalt, quartz and limestone, fragments of fresh aquatic shells, pellets of the same material as the matrix clay and numerous elongated hollows (Fig. 3). Altogether, the sand-sized inclusions compose c. 15% of the sherd volume, ranging between 0.1 and 1.8 mm. The elongated hollows are imprints of vegetal inclusions, like chopped straw. Imprints of organic matter in thick-walled handmade pottery are a long-known phenomenon in the history of pottery making (Shapiro 2012:107; 2016:67; Shapiro and Stern, forthcoming). It was deliberately added to the clay and vanished while firing, making the vessels lighter in weight. The short-time firing was provided at c. 750ºC, which allowed for the sintering of the clay and the burning of the straw particles, leaving some of the dispersed charred organic material within the core of the basin.

Group 3: Naḥal Ẓalmon. This group includes one storage jar (Table 1: No. 8)—a dense sherd with a ferruginous matrix, containing a small quantity of foraminifera and silt composed of quartz and dark minerals. The rare sand-sized inclusions are subrounded to angular and comprise basalt grains, chalk and limestone, and pellets of ferruginous clay (Fig. 4). There are also some minute imprints of organic matter.

Group 4: Karm er-Ras. This group is the most representative of the examined assemblage. It includes eight storage-jar sherds (Table 1: Nos. 1, 2, 3, 5, 6, 12, 16, 18) that exhibit various shades of brown and gray. Jar Nos. 2 and 3 are made of soft fabric, which smudges the hands when rubbed. The matrix is ferruginous, containing c. 15% of silt-sized to fine sand-sized (0.2−0.3 mm) foraminifera and rhombic dolomite. Also, there are rare 0.9−2.5

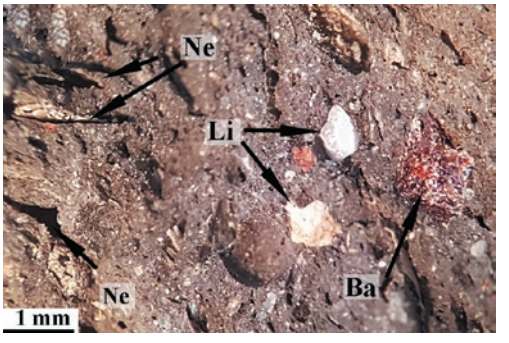

Fig. 3. Photomicrograph of the fresh break of Sample 10 (Li = limestone, Ba = eroded basalt, Ne = imprint of organic matter).

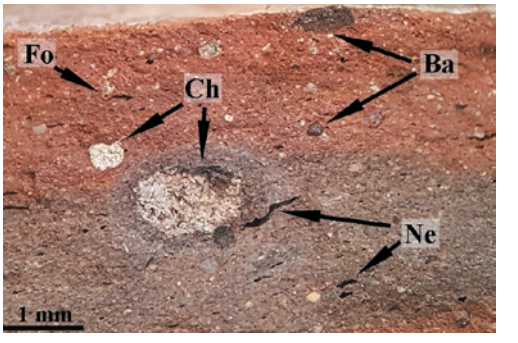

Fig. 4. Photomicrograph of the fresh break of Sample 1 (Ch = chalk, Ba = eroded basalt, Fo = foraminifera, Ne = imprint of organic matter).

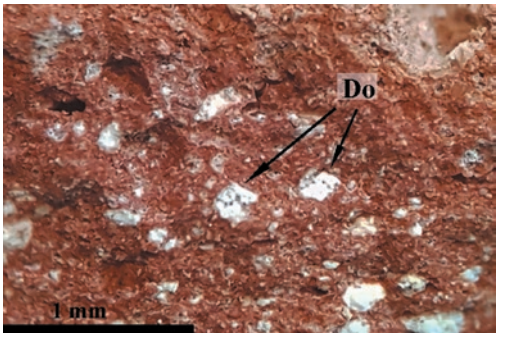

Fig. 5. Photomicrograph of the fresh break of Sample 2 (Do = dolomite).

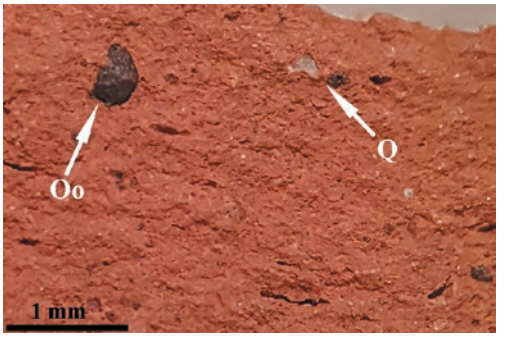

Fig. 6. Photomicrograph of the fresh break of Sample 8 (Q = quartz, Oo = ferruginous oolith).

mm inclusions of chalk, aggregates of dolomite crystals and ferruginous clay pellets (Fig. 5). Jar Nos. 7 and 4 contain inclusions that are slightly coarser than those of the other vessels in this group. Some of the dolomite inclusions in the cores of Nos. 2 and 3 are still crystalline, i.e., their cleavage planes are shiny on the fresh breaks. Closer to the surfaces of these vessels, the inclusions turn milky with a floury consistence, attesting that the vessels were fired at c. 700ºC; alternatively, a more ferruginous clay may allow sintering at lower temperatures. The other jars of this group were fired at c. 750ºC, and even higher. Jar No. 16, a gray sherd, was most likely fired in a reducing atmosphere. Jar No. 13 is of a greenish shade, i.e., fired at a temperature lower than 800ºC, which caused the partial vitrification of the sherd, but did not damage the vessel.

Group 5: Kefar Ḥananya. This group includes one cooking pot and one cooking bowl (Table 1: Nos. 7 and 17, respectively). The sherds are orange-red, dense and clean, with a ferruginous matrix containing some quartz silt. The matrix contains sporadic sand-sized inclusions (0.2–0.3 mm) of transparent quartz and ferruginous ooliths and their fragments (Fig. 6).

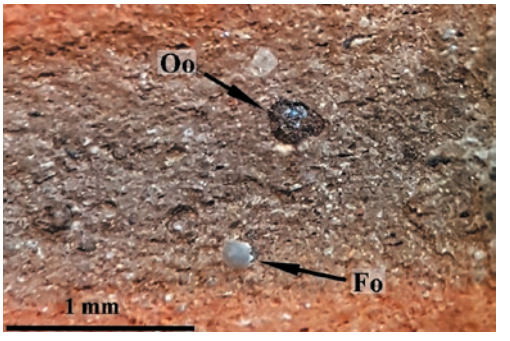

Fig. 7. Photomicrograph of the fresh break of Sample 15 (Oo = ferruginous oolith, Fo = foraminifera).

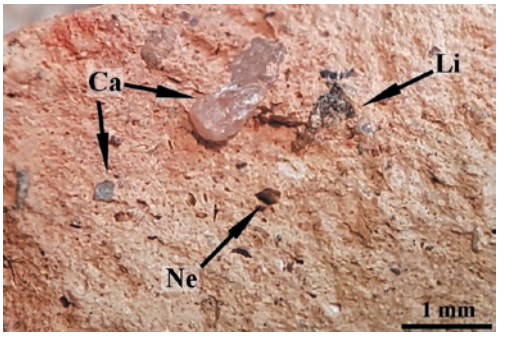

Fig. 8. Photomicrograph of the fresh break of Sample 14 (Ca = crystalline calcite, Li = gray micritic limestone, Ne = imprint of organic matter).

Group 6: Shiḥin. This group includes one storage jar and one "Shiḥin" bowl (Table 1: Nos. 4 and 15, respectively). The sherds are hard and dense, yellowish brown in color. Storage jar No. 4 has a dark gray core and a brown surface, and bowl No. 15 has a gray core. The matrix is ferruginous and contains some foraminifera and quartz silt. The sporadic sand-sized inclusions are 0.2–0.3 mm chalk balls, limestone grains, and complete and fragmentary eroded ferruginous ooliths (Fig. 7). The preservation state of the calcareous inclusions suggests that the firing temperature did not exceed 700ºC.

Group 7: Western Galilee/Yodefat. This group includes one bulbous-rim storage jar (Table 1: No. 14) dated to the Hellenistic period. Its sherd is soft, the matrix is calcareous and foraminiferous. The sand-sized inclusions are badly sorted, ranging between 0.2 and 1.4 mm and comprising c. 7% of the sherd's volume. They comprise sub-rounded fragments of crystalline calcite, chalk, white and gray micritic limestone, fossil shell fragments (Fig. 8), and 0.1–0.2 mm pellets of silty ferruginous orange clay. Accompanying the mineral inclusions are elongated and irregular-shaped imprints of organic matter, e.g., chopped straw or chaff, which was added to the clay and vanished during firing.

Discussion

The lithology observed for the samples attributed to Group 1 points to an area where calcareous marl occurs alongside chalk or limestone, basalt and quartz sand. A comparison with previously examined vessels from the Early Islamic pottery workshop of Tiberias (Shapiro, in prep.; *POMEDOR Project*) revealed a lithological similarity to the storage jar discussed here. Keeping in mind that sources of good raw material were exploited by ancient potters of different historical periods (Goren 1991; 1992; Greenberg and Porat 1996), it may be suggested that the western shore of the Sea of Galilee in general, and the

vicinity of Tiberias in particular, were the provenance of this jar, even though Roman-period pottery kilns have not yet been discovered.

The lithology of the Group 2 vessels corresponds to the western shore of the Sea of Galilee, near Tiberias; however, the composition and the granulometry point to a different production site than that of the Group 1 storage jar.

The lithology of Group 3 suggests the use of brown basaltic soil as raw material (Wieder and Adan-Bayewitz 2002:406–410). A comparison to the samples analyzed by the author from the production-waste stratum excavated above the northern bank of Naḥal Ẓalmon, on the grounds of Kibbutz Ginossar (Mokary, Avshalom-Gorni and Shapiro 2024), reveals a lithological identity between the two. This, as well as the typological and chronological similarity (Avshalom-Gorni, Leibner and Ben Nahum, this volume), allow to suggest this manufacturing center as the most likely provenance for sample No. 1.

The vessels attributed to Group 4 exhibit a lithology identical to that of the storage jars manufactured in the Karm er-Ras pottery workshop (Alexandre and Shapiro 2016:9−10; Alexandre, forthcoming; Shapiro, forthcoming), located c. 20 km as the crow flies to the west of Naṣr ed-Din, within modern-day Kafr Kanna. One of the main Roman roads in the region, from Ẓippori to Tiberias (Roll 1676; 1986; 1995; Tepper 2014), or other parallel country routes, may have served for their transportation.

The lithology of Group 5 strongly corresponds to the Lower Cretaceous Kurnub Group Formations. A comparison with previously examined pottery (Wieder and Adan-Bayewitz 1999:332–334; 2002:395–404) reveals a close similarity between the discussed vessels and the cooking wares manufactured at Kefar Ḥananya,[2] which dominated the Early to Middle Roman cooking-ware market in Galilee (Adan-Bayewitz 1993). The fabric of the products of this workshop is clearly distinguishable with a magnifying glass (Goren and Shapiro 2020). This workshop utilized the *terra rossa* soil of the Ḥananya Valley, contaminated with quartz sand and ferruginous ooliths derived from the Lower Cretaceous sandstones and shales, cropping out at the southern slope of Mount Kefir (Ravikovitch 1969; Levitte and Sneh 2013; personal observation of the author, see n. 2).

The fabric of the vessels attributed to Group 6 is identical to that of the storage jars manufactured at Shiḥin (Shapiro 2017:104, Figs. 4, 5), suggesting the workshop of Shiḥin as their possible place of production.

The fabric of the vessel ascribed to Group 7 suggests the rendzina soil as the parent material for the matrix (Wieder and Adan-Bayewitz 1999:338–340). The soil was mixed, probably naturally, with the sandy material of the stream. The raw material of this bulbous jar shows some similarity to the previously studied Galilean Coarse Ware (Shapiro and Berlin 2012:70–72), suggesting its provenance elsewhere in the western Galilee.

[2] Including samples picked by the author from the pottery kiln dump recorded during the development survey of Road 85 (License No. S-770/2017), directed by Rafeh Abu Raya.

Conclusions

Eight of fourteen examined storage jars have the same lithology and as such, form a homogeneous lithologic group. Their provenance is clearly the Karm er-Ras pottery production center, which may be suggested as the main supplier of storage vessels to Naṣr ed-Din. The rest of the pottery—three jars and a krater—were manufactured in the general area of Tiberias. The cooking wares were probably produced in the well-known regional workshops of Galilee, whose distance from Naṣr ed-Din does not exceed 30 km (Table 1; see Avshalom-Gorni, Leibner and Ben Nahum, this volume: Fig. 1).

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