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BLACK WHEELMADE WARE IN LEBANON: A VIEW FROM THE NORTH

Hermann Genz, Kamal Badreshany and Mathilde Jean

Ever since its first discovery at Megiddo in the 1930s, “Black Wheelmade Ware” has sparked the interest of researchers, especially regarding its origin. Most of the research so far has focused on northern Palestine. Lebanon has occasionally been mentioned as a possible region of manufacture, but so far without providing any detailed evidence. In this article, we discuss the occurrence of “Black Wheelmade Ware” in Lebanon and provide the results of the first petrographic and geochemical data from this region.

Introduction

In the southern Levant, the transition from the EB III to the EB IV, now dated around 2500 BC according to recent radiocarbon dates (Regev *et al.* 2012; Höflmayer *et al.* 2014), is accompanied by marked changes. Almost all urban settlements of the EB II–III disappear in the EB IV or shrink to the size of villages (Mazar 1990; Palumbo 1990; Dever 1995; Mazar 2006), with the exception of Khirbat Iskandar in southern Jordan, explored by Richard and her collaborators since 1980 (Richard *et al.* 2010). Marked changes are also noticeable in the ceramic repertoire. Large platters as well as jars and pithoi with pattern-combed surfaces dominate the EB II–III assemblages, while drinking vessels are hardly attested (Genz 2002; Bunimovitz and Greenberg 2004). In the EB IV, however, platters and combed jars completely disappear, whereas a variety of chalices, goblets, teapots and other types related to drinking customs abound (Bunimovitz and Greenberg 2004; Bunimovitz and Greenberg 2006; D’Andrea 2014; Welton and Cooper 2014). Especially in the pottery, a marked regionalism is noticeable, which has led to the definition of various pottery families (Amiran 1970, 79–89; Dever 1980; D’Andrea 2014). Marked Syrian

influences in the pottery repertoire were noticed from early on (Guy and Engberg 1938; Amiran 1970, 83; Bunimovitz and Greenberg 2004; Welton and Cooper 2014; D’Andrea and Vacca 2015).

In the northern Levant, on the other hand, there is a much stronger evidence for continuity between the EB III and IV, both in terms of settlement patterns and ceramic production (Genz 2012, 621; Thalmann and Sowada 2014, 358; see, for example, Ebla).

Black Wheelmade Ware: Definition and history of research

The term Black Wheelmade Ware was coined only recently by Greenberg (Greenberg *et al.* 1998, 23; Greenberg 2002, 53), whereas formerly it was known as the “Megiddo Group” (Amiran 1970, 81–2). Dever subsumed this pottery under his families N and NC (Dever 1980, 46–47). This pottery was first identified in Megiddo in the 1930s (Guy and Engberg 1938), but since then has been found at various sites in the Jezreel Valley, Galilee and the Hula Valley in Palestine, as well as in Lebanon in the Beqa’ and along the coast, as well as in southern Syria (D’Andrea 2014, fig. 5.3; Bechar 2015, fig. 14).

This ware is characterized by a rather limited repertoire: teapots, goblets and small flasks dominate the assemblages, whereas jars are only rarely attested (D'Andrea 2014, 153–169; Bechar 2015). The fabric is generally dark grey to black, but reddish hues are attested as well (D'Andrea 2014, 153; Bechar 2015, 39). Most vessels show white painted decoration in their upper parts, mainly simple horizontal bands, but wavy lines framed by horizontal bands are also attested. Reserved painting, in which parts of the white paint are removed with a pointed instrument to expose the dark surface of the vessels, is mainly attested in southern Syria. Another characteristic is the rather high firing temperature perhaps approaching 800 or 850°C (Bechar 2015, 40; but see also below).

Contrary to earlier assumptions that this pottery was wheelmade (Guy and Engberg 1938, 148–149; Greenberg 2002, 53), a recent detailed study of the manufacturing technique revealed that the vessels are only wheel coiled (Bechar 2015, 39–40). Concerning the proper definition of the ware, some discrepancies can still be noted. Whereas D'Andrea (2014, 158–159) distinguishes a “western” group, encompassing the finds from northern Palestine and Lebanon, from an “eastern” group which is found in southern Syria, Welton and Cooper (2014, 335) only see the examples from southern Syria as “related,” Bechar (2015, 43–47), however, counts all of these as Black Wheelmade Ware.

Earlier researchers generally traced the origin of the Black Wheelmade Ware to the Middle Orontes Valley (Guy and Engberg 1938, 148; Dever 1980, 50–52) and regarded the vessels attested in the southern Levant as imports. Already in 1978, Tadmor (1978, 10) cautiously suggested a local origin for the Black Wheelmade Ware from Kadash in the northern Hula Valley. The first petrographic analyses of Black Wheelmade Ware were conducted on material from Tell Naama (Greenberg *et al.* 1998, 23), which suggested Lower Cretaceous clay as the raw material. Such clays are attested in the Upper Hula Valley and the Lebanese Beqa'. A Lower Cretaceous origin of the clay was excluded

in a more recent petrographic study (Bechar 2015, 42–43; see also Cohen-Weinberger 2016). In both studies, few details were published in support of these conclusions, so they should be treated with caution. The production location (or locations) of the Black Wheelmade Ware remains poorly understood.

The most recent studies of the distribution of the Black Wheelmade Ware (D'Andrea 2014, 157–158 and fig. 5.3; Bechar 2015) have shown that its distribution encompasses northern Palestine, Lebanon and southern Syria, with Tall Hizzin in the Lebanese Beqa' and Yabroud in southern Syria so far representing the northernmost extension of the distribution (but see below for new finds from Tall Fadous-Kfarabida and Tall Arqa). However, it is not attested in the Orontes Valley; thus, an import from that region can be excluded. The Lebanese Beqa' remains one of the potential areas of origin of this ware, but except for a few general statements in passing, this option has not yet been seriously investigated. In this contribution, we will review the evidence for Black Wheelmade Ware in Lebanon and present the first petrographic investigations for this ware in Lebanon.

Black Wheelmade Ware in Lebanon

The distribution of Black Wheelmade Ware in Lebanon has recently conveniently been summed up by D'Andrea (2014, 157 and fig. 5.3) and Bechar (2015, 43–46). It has to be kept in mind, however, that the state of research regarding the EB IV in Lebanon is scanty at best (for a recent summary, see Genz 2010). Black Wheelmade Ware is represented at six sites in Lebanon: Tall Hizzin and Rafid are situated in the Beqa', while Tyre, Byblos and Tall Fadous-Kfarabida are located on the coast. Tall Arqa, located in the Akkar Plain, produced a few sherds of Black Wheelmade Ware (Figure 21.1).

Tall Hizzin is located in the Beqa' Plain, 11 km southwest of Baalbek. Although excavated by Emir Maurice Chéhab already in 1949 and 1950, the results remained unpublished except for a few short notes (Chéhab 1949–1950, 109; Chéhab 1983,

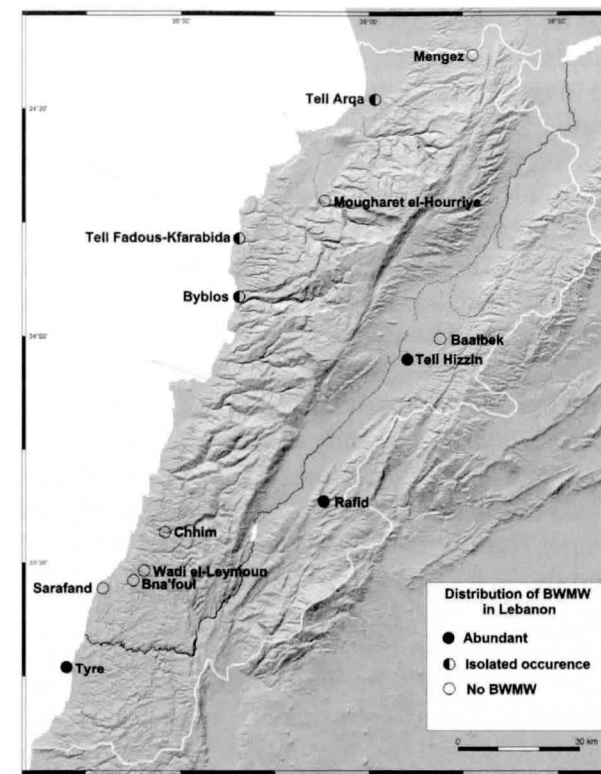


Figure 21.1 Distribution of Black Wheelmade Ware in Lebanon.

167; Marfoe 1995, 241). In the spring of 2007, a team from the Department of History and Archaeology of the American University of Beirut started cataloguing the material located in the National Museum of Beirut for a future publication of the results of this rather important site (see Genz and Sader 2008a; Genz 2010, 209–210 for preliminary assessments).

The discovery of a number of EB IV vessels came as a complete surprise, as this period was never mentioned for Tall Hizzin before (Marfoe 1995, 241). So far, this period only seems to be represented by tombs. There are at least eight tombs, which have produced EB IV pottery. Unfortunately, no information as to the location, layout and number of interments is available; except for the material stored at the National Museum in Beirut and several photographs taken during the excavation, no documentation is available. None of the old excavation photographs provides any

information concerning the tombs of this period. As all of the tombs that contained EB IV pottery have produced later material as well, it may be speculated that they were cave tombs which could be entered and reused in later periods. However, no proof for this assumption is available.

The material consists of pottery types such as goblets, teapots, bottles and amphoriskoi. What is remarkable is the high percentage of vessels of Black Wheelmade Ware (Figure 21.2: 1–4). Of the 20 EB IV vessels available from the site, nine (two goblets, five teapots and two bottles) are Black Wheelmade Ware (Genz and Sader 2008a, 187 and pl. I). A few sherds represent further Black Wheelmade Ware vessels, but as body sherds generally do not seem to have been kept, the actual percentage of Black Wheelmade Ware at the site remains unknown. There is no evidence for EB IV habitation layers at Tall Hizzin, as all evidence for domestic activities represented by vessels such as cooking pots is missing completely.

At Rafid, located in the Wadi Taym southeast of Kamid Loz, an EB IV chamber tomb was discovered during construction work in 1966 and excavated in 1967 (Mansfeld 1970; Prag 1974, 115; Marfoe 1995, 190–191). Unfortunately, in the meantime, the tomb had been robbed, so that mainly the material rescued in 1966 is preserved. The subterranean chamber, which measures ca. 3.00 x 1.50 m, was covered by one monumental stone slab of 3.40 x 2.30 m. The height of the chamber is 1.1–1.2 m. The location of the entrance remains unclear due to damage during the discovery. The chamber was probably covered by a stone tumulus. The finds consist of 13 ceramic vessels, all wheelmade, one dagger, one toggle-pin and one awl or needle, as well as several stone beads and pendants and one carnelian bead. The number of interments remains unclear. Black Wheelmade Ware is represented by four vessels, three goblets and one bottle (Mansfeld 1970, 123–124 and taf. 38, 5, 7; taf. 39, 7–8). Interestingly, white painted decoration is not mentioned in the published descriptions.

In the deep sounding in the Old City of Tyre conducted by P. Bikai from 1973 to 1974, levels XX

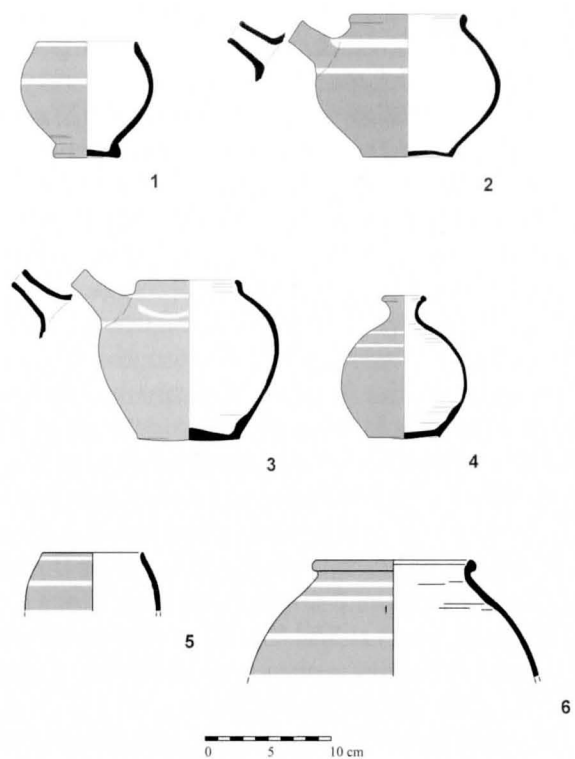


Figure 21.2 Black Wheelmade Ware vessels from various sites in Lebanon. 1–4: Tall Hizzin (Registration numbers 51578, 51690, 51691, 51895), 5: Tall Fadous-Kfarabida (FAD10.305/295.63.3), 6: Tall Arqa (02/112.001).

and XIX can be attributed to the EB IV according to typical pottery such as teapots, amphoriskoi and envelope ledge handles (Bikai 1978, 6 and pls. LIV–LVI). Unfortunately, no architectural remains were encountered in the rather limited sounding. Black Wheelmade Ware seems to be restricted to Stratum XX. No quantitative information on the pottery is available, but out of the 17 published sherds and vessels from this stratum, four can be attributed to Black Wheelmade Ware. Three of them belong to teapots, while the fourth one is just a body sherd (Bikai 1978, pl. LVI, 10–13).

Byblos is certainly one of the most fascinating archaeological sites in Lebanon. Unfortunately, the inadequate excavation and recording techniques employed by the early excavators have

led to great controversies on the exact dating of buildings and objects uncovered there. According to Dunand, the EB III settlement ended in a great conflagration, which he attributes to the invading Amorites (Dunand 1952, 86–90; see Genz 2010, 207 for further comments). Unfortunately, the final publication of the third millennium material is still lacking; but according to studies of the third millennium levels at Byblos undertaken by Saghieh, the site continued to show urban structures during the EB IV, such as religious and probably public buildings (Saghieh 1983, 93–98). Thalmann (2008) has recently published a comparison of the EB IV pottery from Tall Arqa and Byblos. Black Wheelmade Ware is represented by only one teapot from squares 16–17/23 (Dunand 1954, 117 and fig. 114, 7585; for comments on the findspot, see Saghieh 1983, 72 and 95).

Situated 12 km north of Byblos directly on the coast, the recently discovered site of Tall Fadous-Kfarabida has so far produced only scanty evidence of EB IV habitation. EB IV pottery was mainly found in topsoil contexts and a few pits (Genz and Sader 2008b, 154 and pl. 4; Genz *et al.* 2009, 78 and pl. 3; Genz *et al.* 2010, 247 and pl. 10). Some rooms of the EB III Building 4 seem to have been reused by squatters in the EB IV. From a fill in Room 3 in this building comes a sherd of a Black Wheelmade Ware goblet (Figure 21.2:5). The EB IV pottery from Tall Fadous-Kfarabida finds its best comparisons in the material from Stratum 15 at Tall Arqa (Thalmann 2006, 19–32).

Tall Arqa, located on the southern edge of the Akkar Plain in northern Lebanon, has yielded abundant evidence for the EB IV (Thalmann 2006, 2010). Noteworthy is the urban layout with multi-room buildings up to three stories in height, separated by narrow streets. Among the large number of EB IV vessels, very few sherds of Black Wheelmade Ware are attested—one of them from the beginning of Stratum 15, the late EB IV phase, is analyzed here. While no spout is preserved, according to the short neck and the globular body it most likely represents the upper half of a teapot with three horizontal bands in white paint

(Figure 21.2: 6) and a potmark incised before firing on the shoulder. Still unpublished radiocarbon dates place the absolute dating for Stratum 15 between 2250±50 and 2000 BC.

Further EB IV sites, such as the dolmens around Mengez in the Akkar Plain (Tallon 1964; Steimer-Herbet 2000), the Hourriye Cave in the Qadisha Valley (Beayno *et al.* 2002), Baalbek in the Beqa' (Van Ess *et al.* 2008, 110–111 and pl. 2: 9), and the so-far unpublished EB IV tombs in the hinterland of Sidon at Bna'foul (Saidah 1967, 171), Chhim (Saidah 1967, 171), Sarafand (Dahr el-Zaatar) (Saidah 1967, 171; Prag 1974, 115), and Wadi Leymoun (Copeland and Wescombe 1966, 161; Saidah 1967, 171) have not yet produced any evidence of Black Wheelmade Ware.

Petrographic and chemical characterization of Black Wheelmade Ware sherds from Lebanon

Archaeometric analysis of the samples of Black Wheelmade Ware (Table 21.1) was undertaken by ceramic petrography and by Inductively Coupled Plasma-Atomic Emission Spectroscopy and -Mass Spectrometry (ICP -AES and -MS) (Table 21.2) with the aim of reinforcing conclusions of their typological/macrosopic study along three specific lines of enquiry. The goals of these analyses are as follows:

1. To better inform our understanding of raw material preferences, manufacturing processes, firing temperature, degrees of standardization and the degree of the centralization of production of these vessels.

2. To understand the degree of petrographic and geochemical similarity between Black Wheelmade Ware samples throughout its known distribution area in Lebanon and northern Palestine. A high degree of similarity of Black Wheelmade Ware would indicate products of a uniform and centralized production as suspected by some authors (Bechar 2015, 53). Conversely, a low degree of similarity would indicate dispersed and variable production modes. If the latter is true, this study seeks to identify any differences between vessels found on the Lebanese Coast, in the Beqa' Valley, and in northern Palestine.

3. Lastly, an attempt will be made to identify the production location(s) of the Black Wheelmade Ware vessels.

It must be stated that the limited occurrence of the Black Wheelmade Ware in Lebanon means that this study is based on only six samples—too few for statistical significance. In order to overcome the limited nature of the data set and provide greater context, a comparative analysis will be conducted using all published petrographic examples of Black Wheelmade Ware. Additionally, the geochemical information will be combined with a published database of contemporary goblets, bowls and jars from Tall Nebi Mend, Qatna, and the Homs Regional Survey, which are very similar in terms of typology, fabric and technology to the Black Wheelmade Ware (Kennedy *et al.* 2020; Kennedy

Table 21.1 List of samples analyzed for petrography.

Sample number	Site	Date	Type	Fabric	ICP Data
Arqa 02/112.001	Arqa	Arqa phase P	Teapot	A	Yes
Hizzin1	Tall Hizzin		Large Vessel	B	Yes
Hizzin2	Tall Hizzin		Large Vessel	B	Yes
Hizzin3	Tall Hizzin		Large Vessel	B	Yes
Hizzin4	Tall Hizzin		Large Vessel	A	Yes
Hizzin5	Tall Hizzin		Large Vessel	A	Yes
Fadous FAD10.305/295.63.3	Tall Fadous-Kfarabida	Phase V	Goblet	A	No

Table 21.2 ICP-AES and -MS values for the six analyzed samples and LREE to HREE ratios and sums.

	Arqa 02/ 112.001	Hizzin1	Hizzin2	Hizzin3	Hizzin4	Hizzin5
Al ₂ O ₃	15.768	19.793	19.103	18.300	14.341	14.965
CaO	3.865	2.517	7.024	5.949	5.603	3.557
Fe ₂ O ₃	8.542	9.336	9.758	9.286	7.556	8.399
K ₂ O	2.291	0.941	1.027	0.978	1.956	1.874
MgO	4.261	1.912	1.296	1.003	5.159	5.123
Na ₂ O	0.253	0.138	0.151	0.144	0.283	0.254
P ₂ O ₅	0.095	0.119	0.172	0.165	0.172	0.164
Sc	19.71	23.71	22.14	23.78	18.32	19.69
Ti	1.33	3.07	2.00	2.17	1.22	1.35
V	159.50	199.90	183.40	191.70	164.00	151.00
Cr	199.60	253.20	241.90	203.40	197.40	202.30
Mn	0.15	0.08	0.19	0.19	0.15	0.15
Co	33.56	28.97	30.85	32.90	37.21	35.16
Ni	141.80	100.80	103.30	107.20	143.70	157.20
Cu	24.41	27.97	22.30	23.66	23.93	22.03
Zn	122.20	156.30	123.20	123.30	121.10	142.80
Ga	22.45	32.43	27.12	29.06	20.89	22.63
Rb	92.68	43.06	46.79	49.74	80.95	77.20
Sr	108.40	87.11	142.10	153.80	120.80	105.10
Y	31.31	50.45	45.32	47.04	29.13	27.34
Zr	153.80	368.30	245.20	257.60	152.20	150.00
Nb	29.61	76.06	51.40	55.14	28.14	30.57
Cs	4.85	2.58	2.92	3.10	4.31	4.18
Ba	398.20	98.34	143.20	152.60	383.30	361.00
La	43.45	65.35	57.83	61.86	38.65	44.19
Ce	100.80	123.30	117.10	127.10	105.60	106.20
Pr	10.72	15.54	14.34	15.38	9.60	11.05
Nd	40.40	59.88	55.74	59.78	36.39	41.93
Sm	7.53	11.39	10.73	11.39	6.99	7.84
Eu	1.58	2.65	2.47	2.65	1.53	1.66
Gd	6.25	10.12	9.58	10.15	6.09	6.55
Tb	0.98	1.61	1.47	1.55	0.97	1.01
Dy	5.56	9.09	8.10	8.46	5.49	5.44
Ho	1.12	1.80	1.54	1.63	1.07	1.04
Er	3.06	4.76	4.00	4.20	2.85	2.73
Tm	0.50	0.78	0.65	0.69	0.48	0.46
Yb	3.08	4.56	3.82	3.99	2.90	2.75
Lu	0.48	0.71	0.59	0.62	0.45	0.43
Hf	4.26	9.54	6.59	7.01	4.25	4.34
Ta	1.90	4.73	3.26	3.57	1.86	2.04
Pb	21.34	22.88	20.29	22.20	22.85	23.47
Th	13.21	14.56	14.69	16.17	12.17	13.52
U	2.57	2.92	2.25	2.37	2.63	2.42
LREE/HREE	1.74	1.90	2.16	2.14	1.57	1.73
LREE+HREE	98.03	144.49	128.82	137.88	94.16	101.68

2015; Philip *et al.* 2002; Philip *et al.* 2005; Philip and Bradbury 2010; Maritan *et al.* 2005).

The aim of a comparison with the Homs area assemblages is to investigate whether the production and technology of the Black Wheelmade Ware is closely related to the “Caliciform” tradition of that area in particular, as recently suggested by Kennedy *et al.* (2020). If so, it could be posited that the Black Wheelmade Ware vessels were strongly linked conceptually and functionally with forms in contemporary assemblages found in the Homs area; if not, this may indicate that these vessels filled an alternative, but highly specialized role with EB IV societies in Lebanon and northern Palestine.

Analytical methods

The samples were first studied in transmitted light using a Leitz petrographic microscope. Light micrographs were taken with a Leica EC3 digital camera mounted on the microscope. The thin-sections were described using terminology and values proposed by Stoops (2003), Quinn (2013), and Klein and Philpotts (2013). The measurement and quantification of the aplastic fraction of each sample and grain measurements were completed using the digital image analysis software Jmicrovision (Rodit 2007; www.jmicrovision.com). Tiled images of an area on each thin-section measuring one cm² were produced for this purpose.

Five samples were analyzed by ICP-AES and -MS. Chemical analysis using ICP, yields the inorganic elemental composition of each sample, providing a chemical signature that can be used to determine whether different ceramics were made using clays from the same outcrop which can imply a shared production location (Orton and Hughes 2013, 168–183) or, conversely, the use of different clay sources. As the chemical signature can vary even within the same clay outcrop, very close signatures suggests production from a geographically and, potentially, temporally proximate batch of materials, and thus likely the same production location and a similar date.

Following the methodology employed by Hughes (2005), powders were obtained from the profile of

each sherd using a 12-volt dental drill fitted with a two mm diameter solid tungsten carbide bit. The samples were prepared at the Durham Archaeomaterials Research Centre (DARC). The powders were acid digested using hydrofluoric acid and analyzed by ICP-AES and ICP-MS at the Department of Earth Sciences, Durham University. The analysis measured for 39 elements (Table 21.2). The major elements, analyzed by ICP-AES as weight percentage oxide, include Al₂O₃, Fe₂O₃, MgO, CaO, Na₂O, K₂O, TiO₂, P₂O₅ and MnO. The minor and trace elements analysed by ICP-MS as parts per million (ppm) include Co, Cr, Cu, Ni, Sc, Sr, V, Zn, Rb, Y, Zr, Nb, Cs, Ba, Pb, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

A principal components analysis (PCA) (Orton and Hughes 2013, 176–80) incorporating the remaining elements was conducted using SPSS v.22 to plot the similarity of the “chemical fingerprint” of each sample (Figure 21.5). A number of elements were removed from multivariate statistical analyses as various processes can affect them during deposition and sample preparation, including CaO, P₂O₅, Co, Ba and Zr. As the thin-section analysis indicated that closely related clay sources were used for the production of these vessels, the geochemical analysis focused primarily on the rare earth elements (henceforth REE). REE are ideal for geochemical fingerprinting in clays, as they are largely immobile during low-grade metamorphism, weathering, and hydrothermal alteration (Rollinson 1993). As such, REE values, more than other elements, are a good indicator of the original composition of the parent rock. Moreover, recent studies show that there is no fractionation of these elements as a result of the firing process (Finlay *et al.* 2012, 2389). The REE values used for the light REE and heavy REE sums and ratios were normalized using the values for chondritic meteorites as presented in Rollinson 1993 (tab. 2).

Results of the petrography

The petrographic analysis shows that a related set of petrofabrics and preparations, utilizing mostly fine-grained quartz-rich calcareous fabrics, was used for the EB IV Black Wheelmade Ware from

Lebanon. In contrast, ongoing work (Badreshany *et al.*, 2020) shows that unrelated coarser calcareous and shale derived fabrics dominated in the area during the EB II–III and into the EB IV at Arqa (Jean 2020). Likewise, Cohen-Weinberger (2016, 22), in an analysis of Black Wheelmade Ware from northern Palestine, indicated that a comparison with thousands of samples from the IAA collection provided no clear parallels with earlier material from northern Palestine. Thus, Black Wheelmade Ware shows a lack of continuity with the traditions common in earlier periods within its known distribution area. The disconnect in production modes betrays significant functional and, perhaps, conceptual divisions between the early and late third millennium BC ceramic repertoires in Lebanon and northern Palestine supporting ideas first put forth by Bunimovitz and Greenberg that the Black Wheelmade Ware represented the emulation by local populations of the contemporary Syrian drinking customs (Bunimovitz and Greenberg 2004; Bunimovitz and Greenberg 2006).

Similar to the dominant fabrics in the area of Tall Nebi Mend and the Homs Regional Survey during the EB IV, the Black Wheelmade Ware can be described broadly as “Quartz-Calcareous” fabrics. They consist of a clay-rich matrix with a fine texture. The ground mass is dark reddish-brown to brown-black in ppl, indicating firing, at least at some stage, in a reducing atmosphere. The ground mass is rich in microcrystalline calcite, and in some cases an optically active crystallic b-fabric is observed. The ground mass is sometimes well-sintered, and elongate channel voids can occur.

The samples are composed of a similar suite of non-plastic inclusions, but two sub-fabrics, A and B, can be differentiated according to their coarseness (Figure 21.3 and Figure 21.4). Sub-fabric A, consisting of the samples from Tall Arqa and Tall Fadous-Kfarabida, along with Tall Hizzin samples 4 and 5, is fine grained, whereas sub-fabric B consisting of Tall Hizzin samples 1, 2 and 3 is much coarser. Sub-fabric A consists of at least one teapot (Arqa) and one goblet (Tall Fadous-Kfarabida), showing that the fabric crosscuts larger and smaller types.

The typology of the Tall Hizzin samples is problematic as permission was granted only to sample body sherds. The thickness and curvature of these sherds, however, strongly suggests they are larger vessels, probably jars or teapots. Sub-fabric B, the coarser of the two fabrics, therefore, is only found on larger vessels so far, though with such a small data set solid conclusions about how this sub-fabric relates to Black Wheelmade Ware typology cannot yet be drawn. Additionally, the chronological relationship of these two sub-fabrics remains unclear, though the sample from Arqa belonging to sub-fabric A is found in stratum 15 at Tall Arqa (probably dating between 2250–2100 BC). Due to a lack of stratified data, it remains unclear if the coarser sub-fabric B is earlier, contemporary, or later than sub-fabric A.

The aplastic inclusions in the samples are generally subangular to subhedral. Less commonly rounded spherical and elongate grains are noted. Equant grains of fine to medium sand sized quartz commonly occurred. Some samples contained silt sized grains of quartz. The grains were sometimes well rounded, but most often were subangular to subhedral. Pieces of fine to coarse sand sized grains of degraded micritic lime mudstone occur in the samples in varying degrees. Grains of fine sand sized calcite occurred rarely. The samples are generally low in calcium (between ca. 2.5–7.0%), as indicated by the ICP analysis (see below). Rarely, rounded red optically active fine sand sized grains occurred, which were in high relief. These bodies are clay rich and are likely glauconite chlorite, or some form of iddingsite. Iddingsite seems less likely, however, as no evidence of igneous rocks was otherwise noted in the samples.

Sub-fabric A denotes the finest grained fabrics, where the total aplastic inclusions made up 10–12 % of the sample. The average size of the inclusions rarely exceeds that of fine sand (under 150 microns), and silt sized grains of quartz are commonly noted. The samples belonging to sub-fabric B are similar in composition to those of A but are much coarser. Aplastic inclusions make up 15–20% of the samples belonging to fabric B. Additionally,

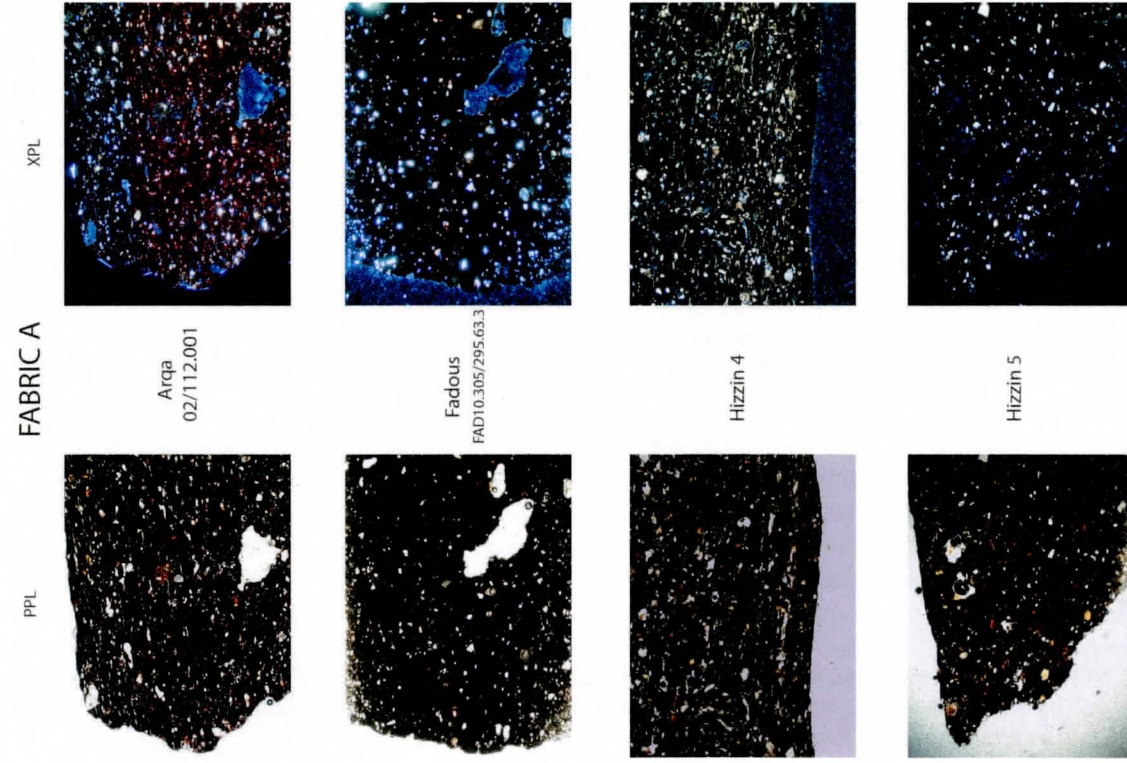


Figure 21.3 Photomicrographs of the samples of Fabric A in Plane Polarized Light (PPL) and Cross Polars (XPL). Field of View is 2 x 2 mm for each photomicrograph.

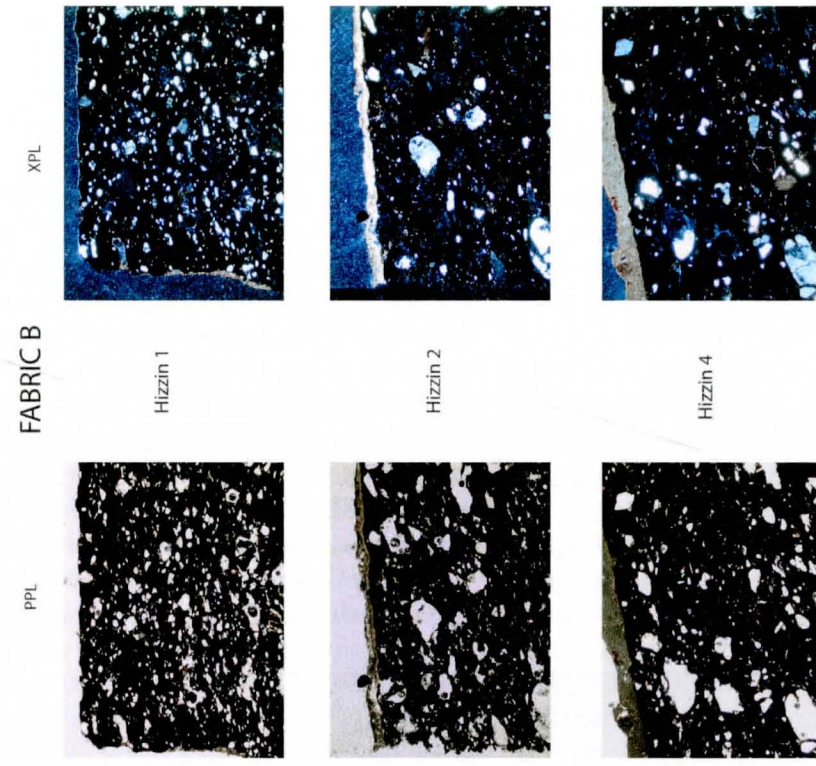


Figure 21.4 Photomicrographs of the samples of Fabric B in Plane Polarized Light (PPL) and Cross Polars (XPL). Field of View is 2 x 2 mm for each photomicrograph.

the inclusions have a larger average size with a number of medium sand sized quartz fragments measuring 300–500 microns observed. The samples belonging to this sub-fabric contain comparatively less limestone relative to those of sub-fabric A. Lastly, in one of the samples of sub-fabric B a few argillaceous rock fragments surrounded by shrinkage voids (perhaps shale) were observed.

Results of the geochemistry

The results of ICP analysis reinforced the petrography, showing two clear groups corresponding to sub-fabrics A and B. For the PCA (Figure 21.5), three components were extracted cumulatively explaining 83.8% of the variation in the dataset. The loading plots associated with the PCA analysis showed that the REE had the most impact on the variability between samples.

The PCA charts show the sub-fabrics A and B form two individual chemical groupings. Though distinct, the ratios of LREE/HREE and total REE data are comparable for both of the Black Wheelmade Ware sub-fabrics, indicating these groups are broadly related and probably composed of clay materials derived from a related geology.

The PCA and REE data indicate that the Black Wheelmade Ware sub-fabrics are distinct from the Tall Nebi Mend, Qatna, and Homs Regional Survey ceramics, though composed of related materials, especially in the case of sub-fabric A. Compared to the wider dataset from the Homs area, the Black Wheelmade Ware samples generally show ratios of LREE/HREE on the higher end of the range. Likewise, these samples are higher in total REE, especially those from sub-fabric B, which have the highest values of all samples in the combined data-

base. Still, the REE values and ratios for the Black Wheelmade Ware are broadly in line with those to those published for the Tall Nebi Mend/Homs area EB IV grey and buff ware ceramics (Kennedy *et al.* 2020), indicating that Black Wheelmade Ware is perhaps made using similar types of clay to the Tall Nebi Mend/Homs area ceramics, but mined from a different outcrop. The Black Wheelmade Ware is also characterized by relatively low calcium values (ca. 2.5–7.0%) compared to most of the samples in the Homs area database and for values reported from EB II–III calcareous fabrics from Lebanon (Badreshany *et al.*, 2020).

The results of the petrographic and geochemical analyses suggest that Black Wheelmade Ware was made from at least two distinct but closely related sets of materials. The vessels are similarly distinct from contemporary Tall Nebi Mend/Homs area EB IV grey and buff ware ceramics. Materials and preparations preferred for both the production of Black Wheelmade Ware and the Tall Nebi Mend/Homs area EB IV grey and buff wares ceramics, however, indicate that they stem from related traditions of craft production and utilize shared technologies.

Provenance, comparative petrography and technological considerations

The petrographic and geochemical analyses demonstrate that Black Wheelmade Ware was made using centralized production modes utilizing a fine quartz-rich calcareous clay. The samples, drawn from a wide geographical area, fell entirely within one of two petrographic and chemical groupings. Caution must be exercised with any interpretation because of the small size of the dataset, though it is worth noting that these findings are in agreement with the typological and petrographic data presented by other authors (Kennedy *et al.* 2020; Bechar 2015; Cohen-Weinberger 2016), which are based on much larger datasets. All of the currently published data points to a tradition centered on a few workshops in an as of yet undefined area or areas (see below). The data from this study shows clear overlap between samples from the Lebanese Coast and

Beqa' (for fabric A) indicating the Black Wheelmade Wares were distributed widely, some distance from their place of origin.

As noted by other authors (Bechar 2015; Cohen-Weinberger 2016), the well-refined nature of the clay makes identifying a provenance for the Black Wheelmade Ware quite difficult. As will be explained further below, the samples are consistent with a wide range sedimentary rock sources found commonly in Lebanon and in northern Palestine. The samples share a particular affinity with the Homs area samples, which suggests they were similarly made of clay formed from Miocene/Pliocene calcareous marls (Kennedy *et al.* 2020; see Ponikarov 1967, 147–148 for a description of these deposits), though without geoprospection and more data it is not possible to confirm that the Black Wheelmade Ware samples were produced using clays formed on these rock types.

This study shows the potential of geochemical analyses to further group samples beyond what is possible with petrography alone, which could contribute substantially to our understanding of the provenance of these vessels, but the dataset is currently restricted to five samples analyzed as part of this study. Given the well-refined nature of the samples, a much larger geochemical dataset and a program of geoprospection will be needed before a convincing assessment of the provenance of Black Wheelmade Ware can be made. Here, all of the known data will be organized and examined, which will serve to definitely exclude some areas as possible locations for workshops and identify others as potential areas to focus future work for sample collection and geoprospection.

Black Wheelmade Ware is found exclusively in Lebanon, southern Syria and northern Palestine; therefore, potential production location(s) are very likely located somewhere in these areas. The Black Wheelmade Ware is most closely related to contemporary assemblages in the Homs area in terms of typology, technology, and materials selection (as defined by the petrography), especially when compared to earlier EB II–III pottery from Lebanon and northern Palestine. The evi-

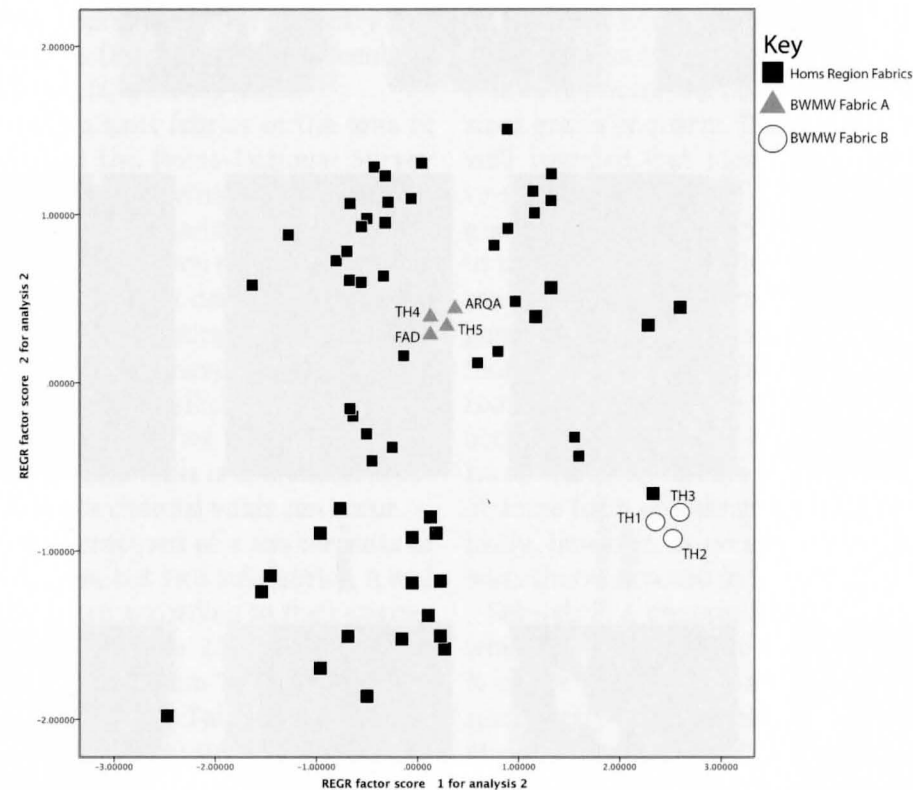


Figure 21.5 Plot of the factor scores generated from the principle components analysis of the chemical data generated by ICP-AES and MS sorted by Fabric. The samples of Black Wheelmade Ware were plotted against samples from the Homs Region.

dence indicates that both assemblages stem from shared knowledge networks between the two assemblages, which suggests geographical proximity. A production location, therefore, should perhaps be sought in areas adjacent to the Homs area, where similar clay materials to those used to produce pottery in the Homs Region could be found. The sharing of technology and knowhow would be facilitated by such a geographical situation, partially accounting for the uniformity of paste preparation and shared elements of ceramic style across the two traditions. Such areas exist in the northern and central Beqa', where Miocene/Pliocene conglomerates, very similar to those around Tall Nebi Mend (Figure 21.6), outcrop extensively and near Tall Arqa in the Akkar Plain where more limited outcrops of these rocks can be found (Dubertret 1955; Ponikarov *et al.* 1963).

The above assessment is circumstantial, and it is certainly possible the Black Wheelmade Ware originated in areas not adjacent to the Homs Region and using materials formed on different types of outcrops. The available data, especially the geochemistry, do however indicate that the use of sources for making Black Wheelmade Ware similar to those selected for the contemporary assemblage of the Homs area, in part through broad similarities in fabrics between the samples of both areas and in part through the exclusion of certain geographical locations and geological outcrops.

First, in the petrographic analyses no definite sign of igneous rocks and very few shales were identified in the samples, indicating the clays were not formed on

or very near the basalt sources found in the region or the Lower Cretaceous shale outcrops common in parts of Lebanon and northern Palestine. Additionally, microfossils were not noted in the samples. Microfossils of various kinds are common in clays derived from sedimentary rock outcrops in Lebanon and northern Palestine (Dubertret 1955; Walley 1998), and are frequently observed in archaeological ceramics from the area (Badreshany *et al.*, 2020; Badreshany 2013; Badreshany and Genz 2009; Griffiths 2006; Goren *et al.* 2004).

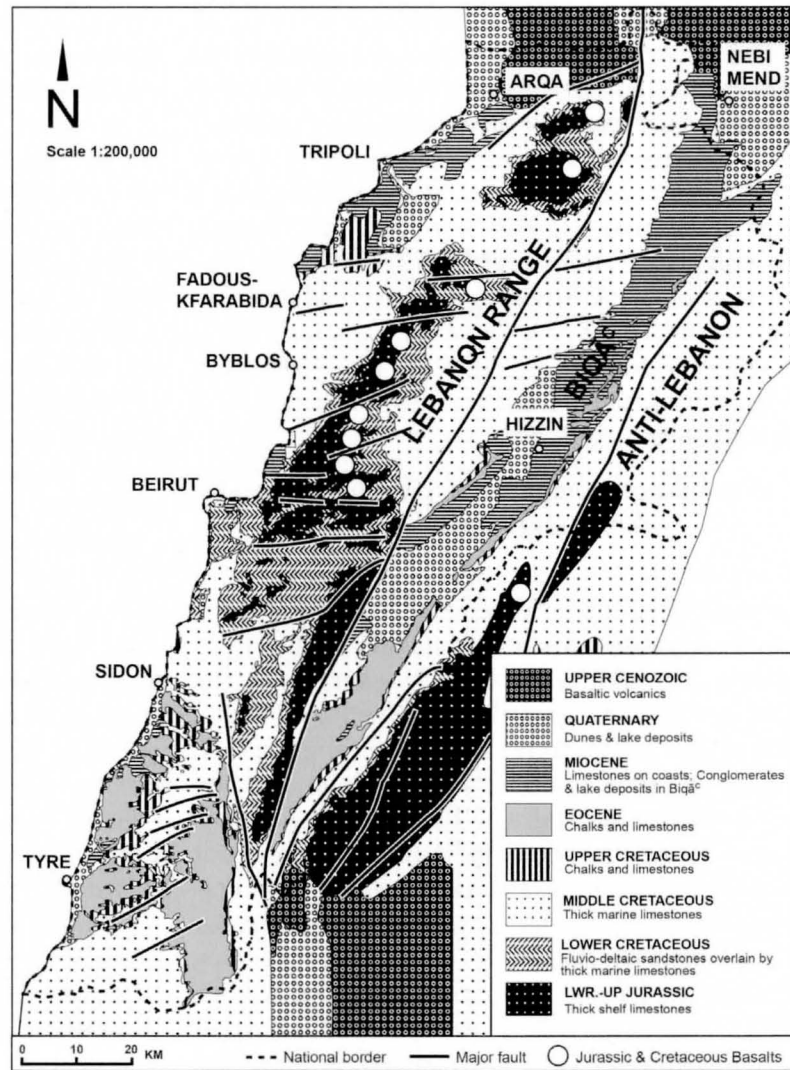


Figure 21.6 General Geological Map of Lebanon with key sites (after Dubertret 1955, scale 1:200000).

Areas adjacent to highly fossiliferous outcrops can therefore also be excluded. The primary fossil bearing outcrops in Lebanon are some limestones of Cretaceous age and especially foraminiferous chalks from the upper Cretaceous and Paleogene age. Geological maps suggest that most of southern coastal Lebanon can probably be excluded as a possible production area along with many parts of the southern Beqa' (Dubertret 1955), since fossiliferous chalk outcrops are very common in these areas. A large-scale petrographic analysis by Badreshany (2013) showed that areas of the southern and northern Beqa' usually did not produce microfossils, whereas parts of the central Beqa' (north of Zahle and south of the source of the Litani River) did so with some frequency (though not exclusively). Petrographic analyses conducted on assemblages from the north of Lebanon (Badreshany *et al.*, 2020; Jean 2020; Badreshany and Genz 2009) again show microfossils are common in the ancient pottery of the areas, though ceramics without fossils are also frequent.

Another factor excluding some areas as production locations for the Black Wheelmade Ware is the nature of the quartz grains observed in the samples. The quartz grains found in the samples are generally sub-angular, likely indicating transportation by wind (aeolian) (Singer 2007). The clays and/or sands used as tempering materials are thus likely not derived from well-transported fluvial or coastal sources. Aeolian angular grains can be expected throughout the study area, but it is worth noting that well rounded and subrounded quartz grains are normally found with some frequency in known coastal EB II-III calcareous fabrics (Badreshany *et al.*, 2020; Badreshany and Genz 2009). With this evidence in mind, it can be cautiously suggested that the Black Wheelmade Wares were made using materials from inland sources that were not transported to a great degree by rivers, though more data is needed to confirm this. The fabrics found at Tall Nebi Mend and in the greater Homs region exhibit quartz grains showing a similar angularity profile to those found in the Black Wheelmade Ware fabrics.

The results of the geochemistry of the Black Wheelmade Ware similarly show they are made with materials that represent a complete break with the calcareous sources used in northern and central coastal Lebanon during the EB II-III for potting. Despite observing some calcareous material in thin-sections of the Black Wheelmade Ware, the geochemistry shows they are much lower in calcium than samples dating to the EB II-III from northern coastal Lebanon. Low calcium values are generally reported for shale tempered fabrics from the Beqa', even when compared to coastal shale fabrics (Badreshany *et al.*, 2020), as well as for few samples from the Homs Region (Kennedy *et al.* 2020, tab. 5). The comparatively low calcium values for Black Wheelmade Ware and samples from the Beqa' could suggest a geographical link between the two fabrics, but again more work will be needed to confirm this.

The REE values of the Black Wheelmade Ware are generally much higher in both total value and in LREE/HREE ratios than values reported for coastal vessels. The Black Wheelmade Ware values are a good fit with some values reported for contemporary quartz-calcareous vessels from the Homs Region. The REE values and LREE/HREE ratios for the Black Wheelmade Ware generally show values higher than those reported for coastal calcareous fabrics and lower values than reported for shale wares in the Beqa'. The REE data further suggests a break with northern coastal Lebanese fabrics dating to the EB II-III and some general relationship with quartz-calcareous fabrics from the Homs area.

The petrographic and geochemical evidence presented above, though limited, suggests that the Black Wheelmade Ware analyzed in this study was likely not produced on or in the region of the Lebanese Coast. The sample from Tall Fados-Kfarabida, therefore, probably originated some distance from the site. In central and northern Lebanon, Tall Arqa is the only site that has so far shown clear evidence of a continuous ceramic tradition spanning the EB III and IV (Thalman and Sowada 2014; Jean 2020). The site is also located

near appropriate clay sources as defined earlier. These two factors could make the region of Arqa a good candidate for the production area of the Black Wheelmade Ware; however, there are two factors that also speak against the Arqa as a source area. First, the petrography of the EB IV ceramics from Tall Arqa showed they have different characteristics from the Black Wheelmade Ware samples (Jean 2020). Second, only very few samples are known from the well-investigated EB IV layers and the extensive pottery assemblage yielded from them (Thalman 2006). If Black Wheelmade Ware was produced at or near Tall Arqa, a larger number of examples would be expected. Samples from Tall Arqa dating to the EB IV have been submitted for geochemistry, and the results when available will provide better understanding of how the chemistry of the broader EB IV ceramic assemblage of Tall Arqa relates to that of the Black Wheelmade Ware.

Although limited, the available evidence, including Cohen-Weinberger's (2016) assessment that no matches for these Black Wheelmade Ware petrofabrics could be made for northern Palestine, suggests that the areas of the northern and southern Beqa' and the Wadi Taym would be the most logical place to focus geoprospection efforts with the aim of identifying possible source areas for the Black Wheelmade Ware. The proximity of the northern Beqa' to the similar traditions found in the Homs Region perhaps makes that region a particularly good place to conduct investigations for at least one of the source areas for the Black Wheelmade Ware.

The usage and preparation of clays for making Black Wheelmade Ware finds close parallels with the pottery of Tall Nebi Mend, confirming the close conceptual link between the two traditions as suggested by Kennedy *et al.* (2020). Technologically, the use of a quartz rich fabric would have contributed to the creation of a hard and durable vessel. The samples of sub-fabric A are so fine that it seems likely that they were levigated (see Maritan *et al.* 2005 for comparative Middle Bronze Age examples of levigated fabrics). Additionally,

the use of low calcium clay sources would have allowed for relatively high firing temperatures, while avoiding the negative impacts of the decarbonation of calcium carbonate, including spalling and vessel failure, which are often encountered during the high temperature firing of more calcareous clays (Rice 2005, 98). The high temperatures would have further contributed to the creation of hard and durable vessels.

Bechar suggested firing temperatures of above 850°C (2015, 40) for Black Wheelmade Ware vessels, though she provided no supporting evidence. Consistently and accurately estimating the firing temperature of the samples in this dataset based on their petrographic characteristics proved difficult due to their relatively fine grain size, homogeneity, and composition. The samples were mostly composed of quartz, a mineral of little use for the visual assessment of firing temperature (Maggetti 1982). X-ray diffraction, though commonly used to estimate firing temperature in ceramics, could not be used in this study due to the limited amount of sample available. Based on the vitrification of the groundmass in a few samples, it is possible to suggest the firing temperature exceeded 800°C in some cases (Quinn 2013, 191). The samples analyzed in this study were relatively well-fired. The oxidized profiles and reduced surfaces commonly exhibited on Black Wheelmade Ware vessels indicate a multi-stage firing in both oxidizing and reducing atmospheres, strongly suggesting the use of built kilns. A larger data-set and more work will be needed to understand exactly how the Black Wheelmade Ware samples were fired and to provide insights into the adoption and development of their associated firing regime.

The potters of the Black Wheelmade Ware made consistent use of specific and carefully prepared materials that could be fired to relatively high temperatures in purpose built structures to produce attractive and hardwearing vessels, indicating they were experienced craftsman possessing a good deal of knowhow.

The petrographic and geochemical analyses supports the ideas of Kennedy *et al.* (2020) that

the Black Wheelmade Ware tradition, with its typological and technological similarities to the upper Orontes horizon of the Homs area, can be described specifically as an emulation of the upper Orontes goblet tradition. The Black Wheelmade Ware tradition, though part of the broader ceramic trends of the "Caliciform" heartland further to the north, is more closely related to those traditions. The ceramic parallels perhaps betray in the Beqa' a shift after the end of the EB III from high levels of socio-economic integration with Lebanese coastal areas toward the development of close links with areas farther to the north in the Orontes Valley. The close ceramic parallels with the Homs Region seem to continue on into the Middle Bronze Age (Genz 2008) perhaps suggesting the continuation of strong socio-economic ties between the Beqa' and areas farther north.

Conclusion

Although the number of Black Wheelmade Ware vessels currently known from Lebanon is much smaller than the material available from the Jezreel Valley, Galilee and especially the Hula Valley, the much lower number of excavations in Lebanon relating to this period definitely has to be taken into account.

Regarding the typology, almost all types attested farther south are present in Lebanon as well, even in similar percentages. Goblets and teapots are dominant, while bottles are much rarer. No jars are attested yet, but even in the southern Levant these are only attested by very few examples.

As for the chronological position of the Black Wheelmade Ware, the evidence from Lebanon adds some crucial information, as at least some of the material derives from well-stratified sequences. D'Andrea (2014, 165–66; see also Bechar 2015, 53) has recently proposed a dating of the Black Wheelmade Ware to the EB IVB, mainly based on typological arguments in comparison to western Syrian assemblages. The most important evidence to confirm such a dating comes from Tall Arqa. At this site, an uninterrupted sequence from the Early to the Middle Bronze Age is attested (Thal-

mann 2006). The EB IV is represented by Strata 16 and 15, that is, the EB IVA and B respectively. The Black Wheelmade Ware sherd of probably a teapot derives from Stratum 15, that is, the EB IVB.

Based on the evidence from Tall Arqa, the EB IV material from Tall Fadous-Kfarabida can be paralleled with Stratum 15. As the EB IVA does not seem to be present at the site, the unstratified Black Wheelmade Ware sherd can be attributed with certainty to the EB IVB.

The situation in Tyre is unfortunately less clear. Stratum XXI should be assigned to the EB III according to the pottery (Bikai 1978, 69–70). If one accepts the proposed dating of Strata XX and XIX to the EB IVB—again based on the pottery (Bikai 1978, 70)—then a hiatus spanning the duration of the EB IVA has to be postulated. Unfortunately, no indication for such a hiatus in the stratigraphic record is mentioned (Bikai 1978, 5–6).

The finds from Byblos, Tall Hizzin and Rafid do not provide any information regarding the chronology of the Black Wheelmade Ware.

Despite the low number of finds, a clear pattern of the distribution of Black Wheelmade Ware in Lebanon is discernable. This ware is well represented in the Beqa' and in Southern Lebanon, whereas it appears only sporadically along the northern coast (Figure 21.1).

One of the most important problems is the location of the production area(s) of Black Wheelmade Ware. Due to the limited number of samples available for this study, the production area(s) still cannot be precisely located. Yet, with the results of both the petrographic and the geochemical studies, several areas can be excluded. This is likely the case for the coastal plain of Lebanon and the southern Beqa'. While the Akkar Plain has limited outcrops of Miocene/Pliocene conglomerates, the scarcity of Black Wheelmade Ware at Tall Arqa makes a production in this region highly unlikely. The geology of the central and northern Beqa', on the other hand, matches the composition of the Black Wheelmade Ware. The evidence from Tall Hizzin and Rafid shows furthermore that Black Wheelmade Ware is well represented in

these regions. A production site around Tall Nebi Mend or farther north in the Orontes Valley—while possible from a geological point of view—is highly unlikely given the absence of Black Wheelmade Ware in this area. Yet typologically Black Wheelmade Ware was inspired by pottery from this region. The long-standing tradition of grey, hard-textured wares in the upper Orontes Valley, reaching back to at least the EB IVA (D’Andrea 2017), further strengthens the possibility that Black Wheelmade Ware originated from an area in the immediate vicinity of this area. Thus, there is a strong possibility that Black Wheelmade Ware may have been produced at one or several sites in the central and northern Beqa’. As this area is not well researched, especially for the Bronze Age, more work is definitely needed to confirm (or refute) this theory.

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