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Cultural Interactions between the Sistan Basin and the Bampur Valley: Grey Wares Characterization in Question During the 3rd Millennium BCE

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Abstract

During the third Millennium BCE, grey wares were the most popular wares in the Indo-Iranian borderlands in which the Bampur Valley and the Sistan basin played a significant role. This research aims to compare grey wares of the above-mentioned regions in order to have a better understanding of possible cultural similarities in both regions. Similarities between grey wares of the regions at the issue have been frequently explained in the light of the long-distance trade mechanism, and considered as a result of the (intentional or unintentional) exchange of pottery techniques and design styles through commercial activities. Eighteen Grey ceramic sherds were sampled at Tepe Bampur and Shahr-i Sokhta, two key-sites, which are respectively located in the Bampur Valley and the Sistan Basin. To compare the raw materials of the ceramic samples after their analyses, some clay samples were also collected from two specific natural clay deposits, located 10 km north and 45 km south of Shahr-i Sokhta, and from the bank and riverbed of the Bampur River. In addition, a clay sample was also collected from a clay deposit in the Pirgel region, located 100 km north of Tepe Bampur and 300 km southwest of Shahr-i Sokhta. By means of XRF techniques, it was attempted to compare different elements of the ceramic and soil samples. The results show that there are close similarities between the chemical elements of the grey wares collected at Shahr-i Sokhta and Tepe Bampur and soil samples from the Bampur Valley and the Pirgel region. Although these similarities are not seen with soil samples of the Sistan Basin, the grey wares of these two sites were completely similar. Finally, it can be stated that the fine grey wares of the Sistan Basin were not locally manufactured but were probably imported from the Bampur Valley and other regions through long-distance trade during the third millennium BCE.

Keywords: Third Millennium BCE, Cultural Interactions, Grey Ware, Shahr-i Sokhta, Tepe Bampur.

ArticleType: Research Article

Introduction

The south-eastern portion of the Iranian Plateau is often labelled as the Indo-Iranian borderlands. This territory consists of Pakistani Baluchestan, southern Afghanistan, Iranian Sistan, Kerman province, the Bampur Valley (Wright 1984:1), and other parts of Iranian Baluchistan (Figure. 1). During the third millennium BCE, communication routes had an important role in establishing several similarities in the cultural material of the different regions in this territory. Grey wares can be considered as the most important material evidence testifying for such cultural and commercial ties fostered by communication routes during the third millennium BCE. These wares were produced for the first time in Togau A phase in Pakistani Baluchestan, and spread throughout the whole region of the bigger Baluchestan, the Indus Valley, the Helmand Valley, the Bampur Valley, Kerman province (Tosi *et al.* 1992: 195), and areas of the southern shore of the Persian Gulf and the

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Oman sea, such as the Buraimi Oasis in the Oman peninsula (Lamberg-Karlovsky & Tosi 1973:40).

The rise and fall of the communication routes during the late third and the early second millennium BCE extensively affected communities in the Sistan Basin in the North, the Bampur Valley in the South and the other sites of the Indo-Iranian borderlands. Tosi, who excavated at Damin in 1969, suggested that the Damin Valley was a corridor connecting the Bampur Valley in the South with the Sistan Basin in the North. Even today, one branch of the Zahedan-Khash-Iranshahr highway passes through this valley. He also suggested that this valley was able to perform the same function in the third millennium BCE: it linked the Sistan Basin in the north to the Bampur Valley in the south during the second half of the third millennium BCE (Tosi 1970c: 10). On the other hand, the Bampur Valley is situated in the Iranian Baluchestan linking settlements in the Iranian Plateau with sites in the Indus Valley (Shaffer 1985: 63). The Valley, which links Central Iran to Pakistan, is a natural highway (Tosi 1974b: 30; De Cardi 1970: 239). This highway was connected to the west along the Bampur Valley, which drains into the marshy Jaz Murian Basin. Prehistoric settlements along the Bampur River were connected to the west through Chah-Hussaini and the Jaz Murian Basin (Tosi 1974b: 30).

There is a number of evidence showing that the Bampur Valley connected to other regions especially to the Sistan Basin during the third millennium BCE. A black-on-grey ware comparable to that of Bampur II occurs at Nazirabad, in the Kech Valley, and considerably extends the south-eastern distribution of this pottery in an area in which only late prehistoric sites have hitherto been recognized. In Afghanistan, comparative material related to the later stages of the Bampur I-IV culture is derived from two settlements in the southeast, Mundigak and Deh Morasi Ghundai, with surface finds from wind-eroded sites in both Iranian and Afghan Sistan supplying an intermediate link. In many cases these sites, concentrated in the southern delta of the Helmand River, have been almost wholly destroyed by the wind, and the prehistory of Sistan has therefore to be reconstructed in relation to the stratigraphy of adjacent regions. The first signs of contact with Sistan occurred during the middle of Bampur III and continued into Period IV (De Cardi 1970: 259).

Although evidence in the southern Makran indicates the importance of the southern path in the early third millennium BCE (Gorgi *et al.* 2020), it seems that during the second half of the third millennium BCE and the early second millennium BCE these paths were more prosperous than the northern ones. There were interactions between the Bampur Valley and the Sistan Basin during the middle of the Bampur III period, but it stopped at the end of Period IV of the Bampur sequences. If

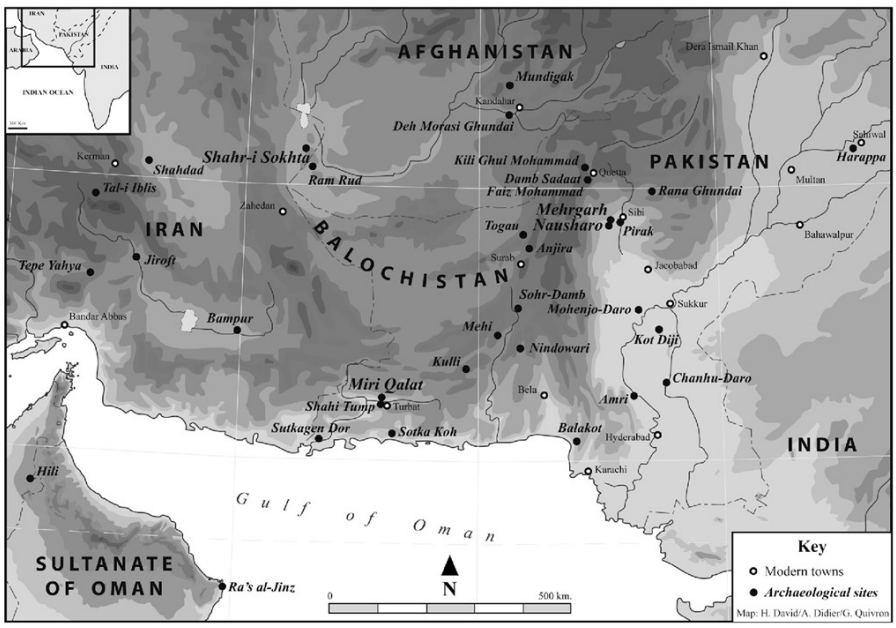


Figure. 1: *Map of the Indo-Iranian Borderlands showing location of Shahr-i-Sokhta, Tepe Bampur and other Bronze age sites (After: Jarrige et al. 2011)*

it is accepted that the wares of Bampur V limitedly resembled those of Mundigak (De Cardi 1968: 142), it would probably make sense that the interactions between the Bampur Valley and the Sistan Basin had been extended to Mundigak in the Kandahar Region.

The Pottery of Periods I-IV of Shahr-i Sokhta can be subdivided into four main typological classes including Buff, Grey, Red and Polychrome Wares. Buff Ware is the most frequently attested ware throughout the town and in each period. Quantitatively it varies between 89% and 99% of the total. Tosi emphasised that these values have been checked by means of several samplings. In fact, Black-on-Grey ware, with its highly-refined, sand tempered paste fired at temperatures exceeding 1000° C was produced from Period I onwards. Therefore, if it is true that as early as period I the inhabitants of Shahr-i Sokhta already knew how to produce Grey Ware, it is not clear why they went on producing the more common types with such relatively less functional characteristics. Lack of ochre and major elasticity of Buff Ware might have been practical reasons for the production of small quantities of Grey Ware (Tosi 1983:132, 133). The pottery of the Bampur I-IV culture was almost wholly wheel thrown, in good quality red and grey wares, and nearly always featuring some kind of decoration, either plastic, painted, or incised. During Period II, grey ware represents about one-fifth of the total, and although clearly a product of the same culture, some convention appears to have restricted its use to certain types of vessels (De Cardi 1970: 277, 281).

History of Research

Sir Aurel Stein was the first scholar who reported the discovery of the grey wares in the Sistan Basin, the Quetta Valley, the Loralai Valley, the Kalat Region, the Kech Valley, the Iranian Makran, the Bampur Valley, and the Kerman Region (Stein 1928, 1931, 1934, 1937). Moreover, his excavation at a number of sites located in the Bampur Valley revealed evidence of the grey wares which were less studied during the chronological development of the sites in the Indo-Iranian borderlands (Potts 2003: 1). Walter Fairservis conducted several archaeological surveys in a vast area including southwestern Afghanistan, Sistan, Zab, Loralai, Pishin, Kalat, Quetta, and Bolān Pass; some of which were excavated systematically (Fairservis 1952, 1956, 1959, 1961). Based on the grey and black wares of the region, Walter Fairservis identified two groups of the grey wares including Feiz Mohammad (Fairservis 1956) and Emir (Fairservis 1961). Beatrice De Cardi, who excavated at Tepe Bampur. introduced wares with carved designs (De Cardi 1970: 320), while black-on-grey ware had been introduced by Sir Aurel Stein (Stein 1928, 1931). This is worth mentioning that the first laboratory studies on the grey ware were fulfilled by the Italian team supported by IsMEO. Laboratory analyses revealed that the grey ware had been made using a well-depurated, sand-tempered clay paste to which up to 25% of yellow ochre had been added. The paste could thus be fired at a temperature of 1100°C without warping or vitrifying. The black color was partly due to the yellow ochre, which carbonizes above 1000°C, and partly to the absorption of combustion residues in the reducing atmosphere of the horizontal draught kilns (Tosi 1983: 133-134). Another research on the grey wares of the region is a Ph.D. dissertation written by Rita Patricia Wright. She studied the typology and the production technique of the grey wares during the third Millennium BCE in, which eastern Iran, southern Afghanistan, central and southern Pakistan. Her results contributed to an assessment of methods currently employed in archaeological research. Moreover, she also explored the influence of early economic exchange patterns, craft specialization, and shared technology on cultural developments (Wright 1984). Marzieh Kordan has analyzed chemical and microstructure of a number of grey ware sherds sampled from Tepe Dasht, 3 km southwest of Shahr-i Sokhta, in Sistan. The results of her research show that the painted grey wares were not manufactured with the soil around the site of the Tepe-Dasht. In general, her research indicates that medium-quality grey wares represented the peculiar traditional wares in the Sistan basin, and were similar to buff wares in terms of constituent elements. This confirms Tosi's opinion that the potters added 25% of yellow ochre to the grey ware clay discovered from the Sistan Basin (Kordan 2011).

General Nature of the soils of the study areas

The Sistan Basin soil is alluvial in nature with Pleistocene clays set on top Pliocene marls and gravels; the latter often survive in the form of isolated hills carved by post-glacial rains and floods (Piperno & Tosi 1975: 186). The clayey character

of Sistan soil did not allow the Helmand to form a continuous riverbed. During periods of aridity, the burden of deposit caused an uninterrupted growth in the level of the riverbed, which was thus unable to hold the bulk of the waters in periods of flood. Therefore, the direction of the river constantly shifts in a clockwise direction in the Northern Hemisphere because of the earth's circuit (Tosi 1969a: 286). Sands and coarse silts are being deposited within the deltaic regions as forest-beds according to known principles of deposition, while fine silts and clays are carried further into the basins of the lakes. Meanwhile, alluvium plains are composed of areas that have been underwater seasonally clay flats are seasonally inundated area (Jux & Kampf 1983: 20, 28). There are many clay resources in the area, which were easily accessed by craftsmen of Tepe Dasht, 3km southwest of Shahr-i Sokhta. Islamic pottery kilns and modern brick kilns testify that the area is a clay resource area. Modern brickyards are located exactly close to clay resources and this means that craftsmen prefer to stay close to clay resources (Mortazavi 2014: 554).

The formation of the clay resources in the Bampur Valley is also directly related to the water flows in the region. The Bampur River, the most important river in the valley, originates from the Caravandar Mountains in the north of Iranshahr; after crossing the Damin Valley and joining the Damin River and several other tributaries, it changes its direction to the west and passes through the Bampur region before emptying into the Hamoon-i- Jaz Murian. This river and its tributaries carry sediments that finally form the soil of the region. These sediments, which are composed of various volcanic and sedimentary elements with different size, are often coarse-grained and rubble at the foot of the mountains. Further in the centre of the plains and the valleys, these sediments gradually become finer-grained and appear as layers of clay (Negaresh & Khosravi 2000: 10). On the other hand, the sedimentation process in the Bampur Valley can be described as the fact that at the beginning of the plains and where water comes out from the mountains, there can be seen a lot of different flood elements. Finally, the river alluviums, sand and silt compounds appear in clay deposits in the periodical flooding parts of the Hamoon-i- Jaz Murian (Zomorodian & Pourkermani 1989: 83-84). Therefore, the accumulation of clay resources could generally be found in the bed of the Bampur River and the north and the south of its the river banks. This phenomenon is one of the most important reasons for the emergence of the Bronze Age settlements, which are located close to water resources in order to have a better access to fertile soil for agricultural activities and clay resources for pottery production.

Materials and Methods

The study materials of this research include pottery of two key sites, such as Shahr-i Sokhta in the Iranian Sistan Basin and Tepe Bampur in the Iranian Baluchestan; and soil samples of the two areas, the Sistan Basin and the Bampur Valley. After obtaining the approval of Cultural Heritage, Tourism and Handicrafts of Sistan and Baluchestan province, a number of grey pottery sherds discovered from Shahr-i Sokhta and kept in the research center of this site were selected in 2015; and a number of grey pottery sherds were sampled non-probabilistically from the surface of Tepe Bampur in the same year. All the samples were classified into three categories in terms of color, including light grey, dark grey and blackish grey. In this classification, the samples selected from Tepe Bampur are known as B-C, and the samples of Shahr-i Sokhta are labelled as S-C (Figure. 2 & table. 1). It was attempted to select those samples that represent the grey wares of the both sites in terms of color spectrums and clay quality. Although the soil samples have been selected after having a reliable understanding of the process of clay resources formation in both of the regions, it was also important to estimate the distances between the clay resources and the sites. Soil samples of the Sistan Basin were selected from the mines of Shahr-i Sokhta , 10 km north of the site, and Shileh, 45 km south of Shahr-i-Sokhta. In the Bampur Valley, soil samples were collected from the riverbed (2 samples) and the riverbank (1 sample) of the Bampur River near the Bampur city and 1 sample was collected from the Pirgel Gelfeshan (Mud volcanoes of Pirgel), 100 km north of Tepe Bampur and 300 km southwest of Shahr-i Sokhta. In this study, each soil sample is identified by an acronym/abbreviation, for example B-S 1 is used for the sample collected from the riverbank of the Bampur River, B-S 2 and B-S 3 for the samples from the riverbed of the Bampur Valley, Abbreviation of S-S 1 for the sample of the Shahr-i Sokhta mine, S-S 2 for the sample of the Shileh mine and finally, P-S 1 is the abbreviated code to identify the sample from Pirgel mud volcano. It is noteworthy that from

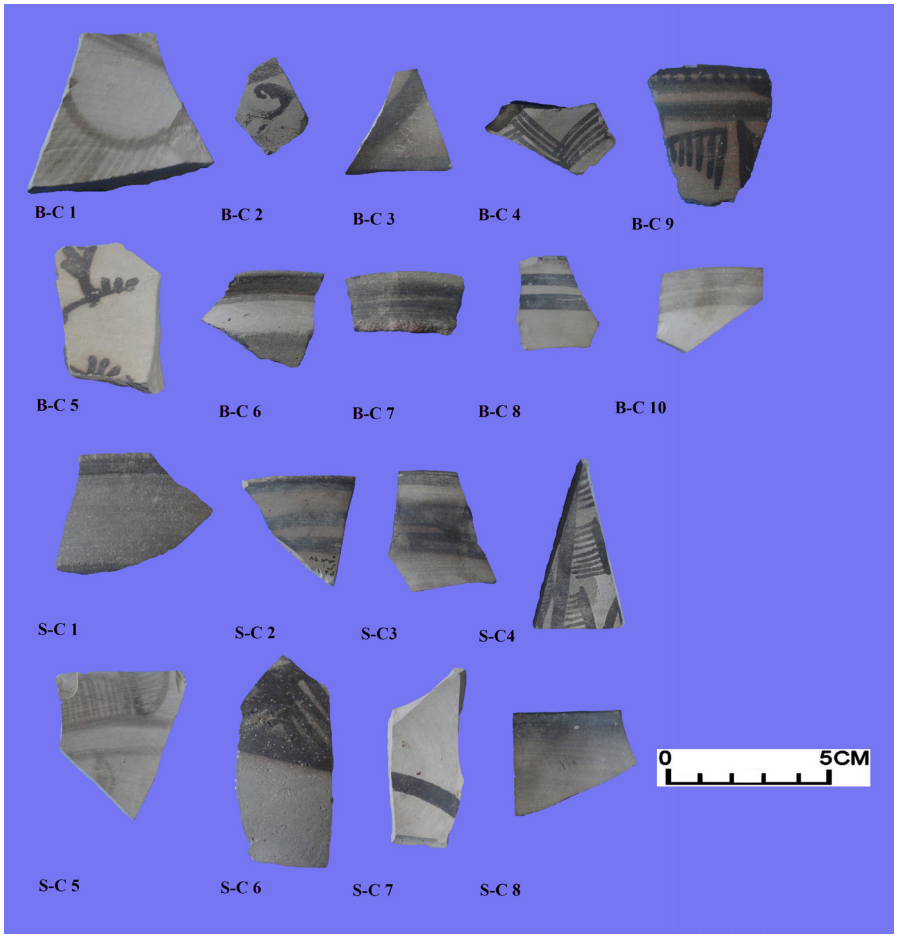


Figure. 2: *Grey Ware Sherds sampled from Shahr-i-Sokhta and Tepe Bampur*

Table. 1: *Characteristic features of the Ancient Wares*

No.	Cod	Site	Paste Quality	Color based on soil chart	Decoration
1	B-C 1	Bampur	Fine	5BP 6/1	yes
2	B-C 2	Bampur	Fine	2.5YR 6/1	yes
3	B-C 3	Bampur	Fine	10Y 7/1	yes
4	B-C 4	Bampur	Fine	7.5YR 6/1	yes
5	B-C 5	Bampur	Fine	10Y 8/1	yes
6	B-C 6	Bampur	Fine	7.5Y 7/1	No
7	B-C 7	Bampur	Modrate	10GY 4/1	No
8	B-C 8	Bampur	Fine	N 7/0	yes
9	B-C 9	Bampur	Fine	7.5GY 5/1	yes
10	B-C 10	Bampur	Fine	N 8/0	yes
11	S-C 1	Shahr-i Sokhta	Modrate	10GY 4/1	No
12	S-C 2	Shahr-i Sokhta	Fine	N 6/0	yes
13	S-C 3	Shahr-i Sokhta	Fine	10R 5/1	yes
14	S-C 4	Shahr-i Sokhta	Fine	2.5YR 6/1	yes
15	S-C 5	Shahr-i Sokhta	Fine	5BP 6/1	yes
16	S-C 6	Shahr-i Sokhta	Fine	2.5YR 6/1	yes
17	S-C 7	Shahr-i Sokhta	Fine	N 8/0	yes
18	S-C 8	Shahr-i Sokhta	Fine	2.5YR 5/1	No

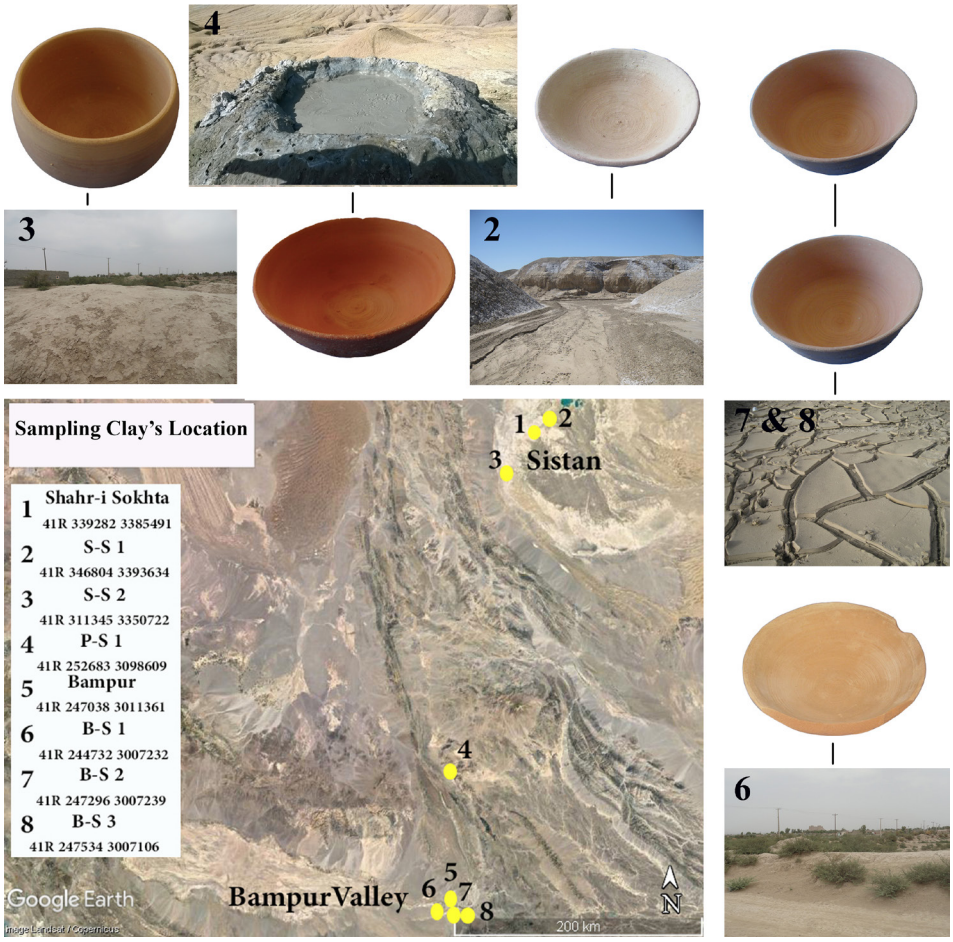


Figure. 3: *Google earth map showing the studied areas and the simulated wares, manufactured by sampled soils (After: Google earth, depicted on 01/11/2017)*

all the mentioned soil samples, several wares were experimentally simulated and then their elements were analysed to have a better understanding of similar elements of the third millennium BCE samples.

All the vessels produced from the mentioned soil samples were analyzed by XRF analytical technique by the Philips Pw1480 equipment in the Binalood Deposits Company. The results enabled us to classify the similarity of the main elements of the vessels and the soil samples by hierarchical cluster analysis using SPSS software. The main oxides (including SiO2, Al2O3, NaO2, MgO, K2O, CaO, Fe2O3) were considered as main variables. The measurement of distance between the clusters was assessed by the *"Ward's method"* (see Backhaus *et al.* 2021).

Results

The results of laboratory analysis indicate a significant difference in the amount of Silica and Alumina data of the samples taken into account compared to high quality clay or porcelain clay. A large amount of Calcium Oxide, which indicates soil impurities, can be seen in samples B-S 1. Although the amount of Calcium Oxide in samples B-S 2 and B-S 3 is lower, the low amount also indicates soil impurities. Sample B-S 1 has less iron element than high quality clay, while B-S 2 and B-S 3 have more iron element, which is a reason for the red color of the ceramic paste made with the Bampur riverbed clay. The amount of silica in S-S 2 and S-S 1 samples is less than the other soil samples and their calcium content is also much higher. S-S 1 and S-S 2 samples have less amount of silica than the remaining soil samples, while their calcium amount is much higher than the other soil samples. Regardless of the amount of silica, these two samples possess elements similar to the B-S 1 sample. The amount of silica and alumina in P-S 1 sample is higher and its iron is less than other soil samples. At the same time, the low amount of calcium oxide and magnesium oxide in this sample has made it better

in quality than other soil samples. In Bampur soil samples, B-S 2 and B-S 3 taken from the riverbed have less impurities than B-S 1 taken from the river bank. Sample of P-S 1 contains higher amounts of Silica and Alumina than other samples, while its iron amount is lower. It is noteworthy that the better quality of this sample than other samples is due to the low amount of Calcium and Magnesium Oxides. The Bampur riverbed soil samples, B-S 2 and B-S 3, have better quality than B-S 1 sampled from the riverbank. In all the analyzed Potteries samples, large amounts of Silica, Alumina and Iron Oxide were observed, which is more than the standard limit; this indicates the difference between those samples and high-quality clay. The sample B-C 2 has the lowest amount of Calcium Oxide and the highest amount of Magnesium Oxide compared to other samples. Calcium Carbonate is calcined at 700 to 850 ° C and decomposes into CO2 and CaO. High levels of Calcium release CO2 and consequently porosity in the samples. Also, the available CaO tends to give bright colors to samples, including white (Emami *et al*. 2014: 9). Therefore, it is obvious that light and dark colors as well as the degree of porosity of the samples are related to the ratio of calcium to other elements of each sample. The B-C 6 sample has the highest percentage of Calcium Oxide among the wares, which probably the cause of its light color is due to this reason. The B-C 7 sample has the highest level of Silica among other samples of the wares. The S-C 1 sample also has less level of iron than other samples. The high level impurity of the Calcium and Magnesium Oxides in the S-C 1 sample may have led to the poor quality of the ware paste. This sample is most similar to the soils of the Bampur Riverbank. However, there is a slight difference between the of calcium oxide level of the two samples and this might be a result of different sampled environments (Table. 2).

Based on the clustering, the results of which can be seen in the dendrogram diagram, five groups, which have the most similarities in their elements, can be seen (Figure. 4). As shown in Figure 4, the samples that fall into group one are B-S 2, B-S 3, S-C 7, S-C 8, B-C 3, B-C 8, B-C 5, S-C 5 and B-C 6. The samples of the second group, which includes samples S-S 2 and S-S 1, are less than the samples of the first group. Examples S-C 1, B-S 1 and B-C 7, which are slightly similar to the second group, are in the third group. Considering that this group is slightly similar to the Sistan soil samples in terms of elements, the existence of S-C 1 sample in this group seems logical. Samples B-C 2, B-C 9 and S-C 6 form the fourth group and the closest classification to the fifth group, which consists of samples B-C 1, S-C 3, B-C 4, S-C 2, B-C 10, S-C 4 and P-S 1.

Discussion

Although the two mentioned resources of clay in the Sistan Basin have the purest soil compared to other resources, the results of experimental analyses show that even the raw materials of fine grey wares in the Bronze Age sites of the Sistan Basin were not supplied from these two resources. Laboratory analysis on the pottery and soil samples around Tepe Dasht, as one of the main centres for pottery production for Shahr-i Sokhta, have shown that potters used the soil around the area to produce buff wares as well as medium quality grey wares, but not the fine grey wares. The fine grey wares discovered from Tepe Dasht have shown a ceramic fabric with qualities different from the soil resources around the site (Kordan, 2011), but based on the laboratory results of this study, it seems that the raw materials of the fine grey wares discovered from Tepe Dasht were not prepared from the two mentioned clay resources in the Sistan Basin.

The soil sample B-S 1, which was sampled from the Bampur Riverbank, is the closest soil sample to S-S 1 and S-S 2 in terms of constituent elements. Besides that, B-C 7 and S-C 1 grey wares, which have medium paste quality, are the most similar samples of pottery to this soil resource. Therefore, it can be suggested that the soil of the Bampur Riverbank and also the two soil resources of the Sistan Basin are probably not suitable for the production of the fine grey wares. This point confirms the production of medium quality grey wares by the potters of the third millennium BCE of the Sistan Basin and the Bampur Valley.

The three samples B-C 2, B-C 9 and S-C 6 are not similar to any of the soil resources of the Sistan Basin and the Bampur Valleys, but in terms of constituent elements, they are similar to B-C 1, S-C 3, B-C 4, S-C 2, B-C 10, S-C 4 and the Pirgel mud volcano sample. Accordingly, the possibility of the production of these three samples with the soil resources of the Baluchestan region (Pirgel Mud Volcano) is not a remote hypothesis.

The Bampur Riverbed and Pirgel Mud Volcano samples are finer and purer than other soil samples. Six samples of potsherds are more similar to the Pirgel Mud Volcano sample than the Sistan Basin

Table. 2: *The main constituents of wares and soils samples based on XRF analysis*

Samples	SiO2	Al2O3	Na2O	MgO	K2O	TiO2	MnO	CaO	P2O5	Fe2O3	SO3	LOI
	%	%	%	%	%	%	%	%	%	%	%	%
B-S 1	59.00	14.10	1.81	5.83	2.59	0.75	0.10	9.22	0.14	5.94	0.10	0.26
B-S 2	56.80	15.41	1.16	6.28	2.98	0.80	0.12	7.93	0.13	7.61	0.34	0.30
B-S 3	56.43	15.64	1.25	6.55	3.22	0.79	0.12	7.72	0.12	7.64	0.00	0.34
P-S 1	61.23	16.00	2.38	3.80	3.59	0.83	0.07	5.23	0.14	5.72	0.37	0.45
S-S 2	54.68	14.66	1.62	6.23	3.63	0.72	0.11	11.31	0.12	6.51	0.13	0.08
S-S 1	55.43	14.68	1.98	6.90	3.13	0.73	0.09	10.02	0.12	6.09	0.22	0.42
B-C 1	59.43	16.86	1.06	4.81	3.80	0.89	0.08	10.02	0.12	7.47	0.00	0.65
B-C 2	62.35	14.72	1.45	6.07	3.40	0.89	0.14	4.65	0.12	7.69	0.00	1.13
B-C 3	57.67	16.55	1.25	5.17	3.23	0.84	0.10	1.84	0.13	8.08	0.00	0.70
B-C 4	59.64	15.79	2.06	4.65	3.33	0.79	0.09	6.10	0.13	6.73	0.04	0.83
B-C 5	57.79	14.54	2.07	5.40	3.17	0.78	0.11	5.69	0.16	6.78	0.00	1.78
B-C 6	57.15	14.74	1.65	5.11	3.38	0.77	0.09	6.93	0.14	6.19	0.00	2.13
B-C 7	62.64	13.07	2.02	4.13	2.64	0.71	0.10	8.42	0.12	6.16	0.54	0.10
B-C 8	58.61	16.52	1.39	5.33	3.44	0.87	0.09	7.57	0.12	7.56	0.00	0.01
B-C 9	62.44	15.31	1.17	5.40	3.49	0.92	0.07	5.82	0.14	7.80	0.03	0.26
B-C 10	59.27	15.61	1.45	4.60	3.29	0.88	0.09	2.81	0.12	7.88	0.00	0.19
S-C 1	59.25	13.99	2.82	5.12	2.62	0.61	0.09	6.35	0.12	5.28	0.47	1.64
S-C 2	59.77	16.36	1.55	4.83	3.37	0.82	0.08	6.81	0.20	6.83	0.10	0.60
S-C 3	60.15	17.00	1.42	4.59	3.76	0.87	0.07	5.27	0.19	6.81	0.00	0.34
S-C 4	57.75	15.36	3.38	4.56	3.27	0.79	0.07	4.65	0.18	5.54	0.10	2.86
S-C 5	58.06	15.43	1.85	4.42	3.32	0.83	0.08	6.44	0.40	6.83	0.00	2.10
S-C 6	61.25	15.77	1.54	5.33	3.26	0.84	0.09	3.41	0.14	6.95	0.32	0.92
S-C 7	57.61	16.34	1.65	5.50	3.19	0.84	0.09	6.10	0.27	6.75	0.25	1.11
S-C 8	58.03	16.43	1.34	5.34	3.25	0.83	0.09	5.61	0.12	6.87	0.00	1.87

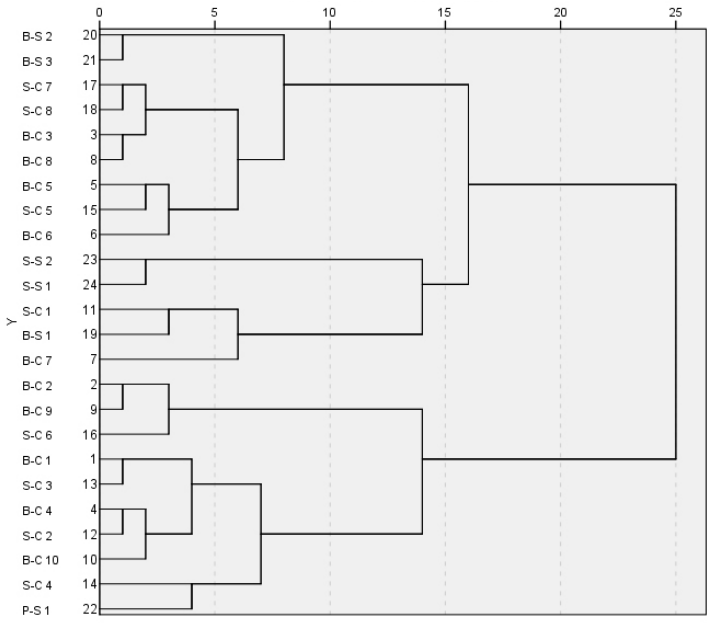


Figure. 4: Clustering of ancient and simulated wares based on Dendrogram using ward linkage re-scaled distance cluster combine

and the Bampur Valley samples in terms of their constituent elements. However, in the possibility of using the Pirgel Mud Volcano materials in the Bampur Valley, considerations such as the distance to the sites of the third millennium BCE should be taken into account. Due to the high percentage of grey pottery in the Bampur Valley, the use of remote resources could not be economically viable. However, more studies are needed to better understand whether the Bumpur Valley craftsmen used Pirgel resources or not.

It is necessary to mention that considering that the number of the fine grey wares in the Sistan Basin is very small and that these wares are among the leading vessels in the region in terms of elegance and quality of manufacture, they can also be considered as precious wares or luxury items. Accordingly, the movement of these wares as a commercial commodity between the Sistan Basin and the Bampur Valley and areas with soil similar to the Pirgel Mud Volcano materials is a grounded hypothesis. Perhaps most remarkable is the large percentages of grey wares found at the site of Bampur, where in some periods this class represents one fifth of the ceramic assemblage. This percentage is considerably high when compared to Shahr-i Sokhta or Tepe Yahya in the nearby Kerman Province, where it represents less than five percent (Wright 1984: 68). The manufacturing techniques and standards in the production of grey wares, unlike buff wares, had not been changed in different periods of Shahr-i Sokhta. Tosi believed that craftsmen of Shahr-i Sokhta started to be familiar with how to refine the clay and the required temperature for backing the grey ware since period I (Tosi 1983: 133).

This stability in the standards of production of the fine grey wares in different periods of Shahr-i Sokhta can be probably explained in the light of two reasons: firstly, the Sistan Basin was probably not the place for the production of this type of wares; secondly, fine grey ware was manufactured or imported for a special group of social classes.

Conclusions

The archaeological evidence discovered from the Bronze Age sites in southeastern Iran suggests cultural interactions between different regions in the Indo-Iranian borderlands. The Sistan Basin and the Bampur Valley are among the regions that played a significant role in these interactions, as they have also acted as intermediary between different regions. In the case of the fine grey wares, the results of this study, as well as other evidence, show that the Bampur Valley was the possible place for the production area of these wares. As stated, there is not similarities between the two clay mines of the Sistan Basin and the fine grey wares. It should also be noted that medium-quality grey wares were probably manufactured in the both regions. The similarity of the grey wares of the two regions, which is also confirmed by the results of elemental analysis, along with the ancient evidence of production of these vessels in the Bampur Valley and non-production in Sistan can provide a better understanding of the relationship pattern between the two regions during the third millennium BCE.

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