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RESEARCH PAPER

Uncovering Ceramic Craft of Indus Tradition: Analysis of Flanged Vessels from the Salt Range Musa Khel, Northern-Western Region of Greater Indus Valley

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ABSTRACT

This study examines flanged vessels from Musa Khel, a significant Indus Tradition site in the Salt Range, Greater Indus Valley. These vessels, notably prominent during the Early Harappan Kot Diji Phase (c. 3200-2600 BCE), are analyzed for their morphology, decoration, composition and cultural context. Despite their widespread presence, detailed studies in the Salt Range have been limited. Using a metric system and scales for description and frame work of Indus Tradition for chronological analysis, this research reveals the vessels' diverse, morphology, designs and likely local production. Their cultural context aligns with the Early to Late Kot Diji phase (c. 3200-2000 BCE), similar to findings at Gumla, Rehman Dheri, and Sarai Khola. The study emphasizes the importance of further investigation into these flanged vessels to provide new perspectives on the origins and development of the Indus Civilization.

Keywords: Indus Tradition, Musa Khel, Salt Range Indus Flanged Vessels

Introduction

The Salt Range, renowned for its diverse geological features, located between the River Soan and the River Jhelum in northern Punjab, forming the southern border of the Pothohar Plateau (Samini 2009:65-66). It is also enriched with archaeological remains spanning the Indus Tradition and Early to Late Historic periods (Dar 2001:25-37). Among the notable archaeological sites in this region is Musa Khel, situated at the foothills of the Salt Range in Mianwali district. Musa Khel is crucial due to its location at the north-western edge of the Greater Indus Valley and its proximity to various other key archaeological regions (Figure 1).

The Musa Khel site (32°64′26′′N, 71°75′05′′E; elevation: 271 m) is located at the northern edge of Musa Khel village (Mianwali district), from which it derives its name (Figure 2). The site is characterized by a large mound and is currently in a highly disturbed condition (Figure 3). Surrounding archaeological regions of significance include Gomal and Tochi Valleys to the west and southwest, Sakesar Valley and the Pothohar Plateau to the north and northeast, the Sindh Sagar Doab to the south, and the Ravi Plains with Harappa to the southeast (Figure 3).

Literature Review

Archaeological investigation at Musa Khel began with its discovery and initial surface observations (Dani 1971). This was followed by investigations aimed at tracing the provenance of stone artifacts recovered from various levels at Harappa. These studies have

highlighted the socio-economic significance of Musa Khel and the Salt Range within the Greater Indus Valley during the Indus Tradition (Law 2011). Subsequent investigations focused on the site's disturbed archaeological context, state of preservation, chronology, commercial interactions, and craft traditions, particularly pottery (Butt 2022; Butt 2024). Pottery is a significant craft at the site, with over thirty-seven utilitarian types documented, each exhibiting distinctive features and varying temporal and spatial occurrences across the Greater Indus Valley. The flanged pottery type is especially prominent in the Musa Khel pottery collection.

Despite extensive research on pottery in the Indus Valley, there is a notable gap in detailed studies of specific pottery types, such as flanged vessels, within the context of the Salt Range. The pottery studies conducted in the north-western region are confined only to describing assemblages (Mughal 1972a; Dani 1971; Durrani 1988 etc), except few technical studies, which have addressed specific features (Petrie et al 2008 etc.).While flanged vessels are documented across the Indus Valley and Balochistan, their detailed study in the context of Salt Rang has been limited. This research aims to address this gap by providing a comprehensive analysis of flanged vessels from Musa Khel, focusing on their morphology, decoration, and composition. Besides, manufacturing, spatial and temporal occurrence and chronological analysis has remained focus of present study. By examining these vessels, this study seeks to enhance our understanding of their significance in the broader archaeological context of the Indus Valley and surrounding regions.

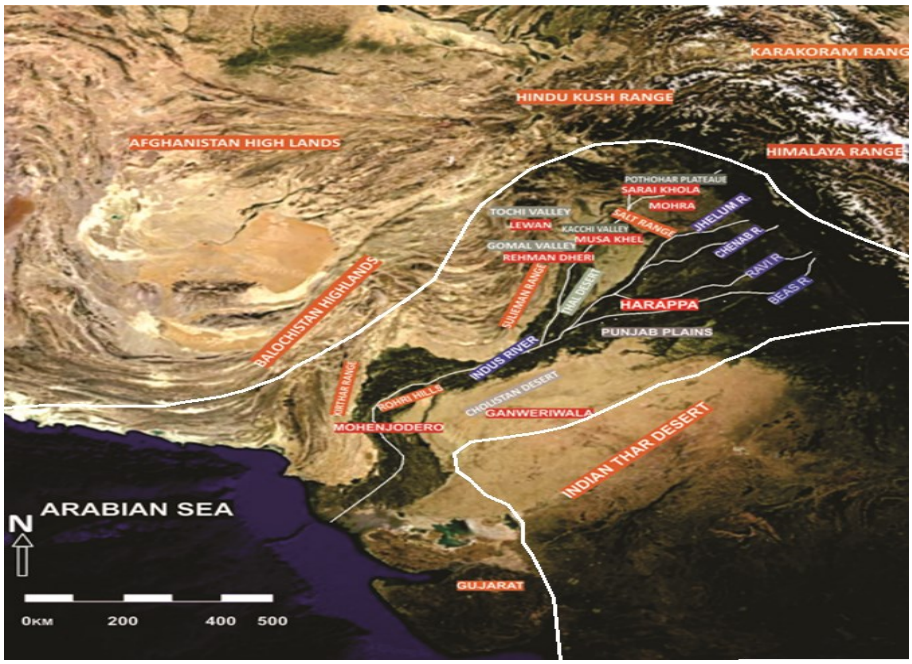


Figure 1: Map of the Greater Indus Valley showing the location of Musa Khel and other significant regional sites associated with the Indus Tradition (Butt 2020).

Material and Methods

To conduct the present study, specimens of flanged pottery from the Musa Khel collection were selected using a traditional field walk method. These vessels were described based on morphology (Dales & Kenoyer 1986). The study focused on both intrinsic features (such as paste, forms, and decorations) and extrinsic features (including place of origin, production, and technology). Various scales were devised and adopted for analysis, including vessel size (Hussain 1992), section thickness, paste texture (Butt 2022), and grain or inclusion abundance (Druc 2015). A Dino-Lite digital microscope was used to examine texture, and Munsell Color Charts (2009 revised/2012) were employed to describe colors

accurately. Indus Tradition Cultural Frame Work (Table 1) modified from Shaffer (1992); Kenoyer (1991) and Law (2011) has been adopted.

Table 1
Indus Tradition Cultural Frame Work

Eras	Phases
Foraging Era (10,000 to 2000 BCE)	Mesolithic and Microlithic
Early Food Producing Era (7000 to 5500 BCE)	Mehrgarh Phase
Regionalization Era (5500 to 2600 BCE)	Early Harappan Phases: Sheri Khan Tarakai, Tochi Gomal, Hakra, Ravi, Balakot, Amri, Kot Diji, etc.
Integration Era (2600 to 1900 BCE)	Harappan Phase; Late Kot Diji Phase
Localization Era (1900 to 1300 BCE)	Late Harappan Phases Punjab, Jhukar, Rangpur, Bara, etc.

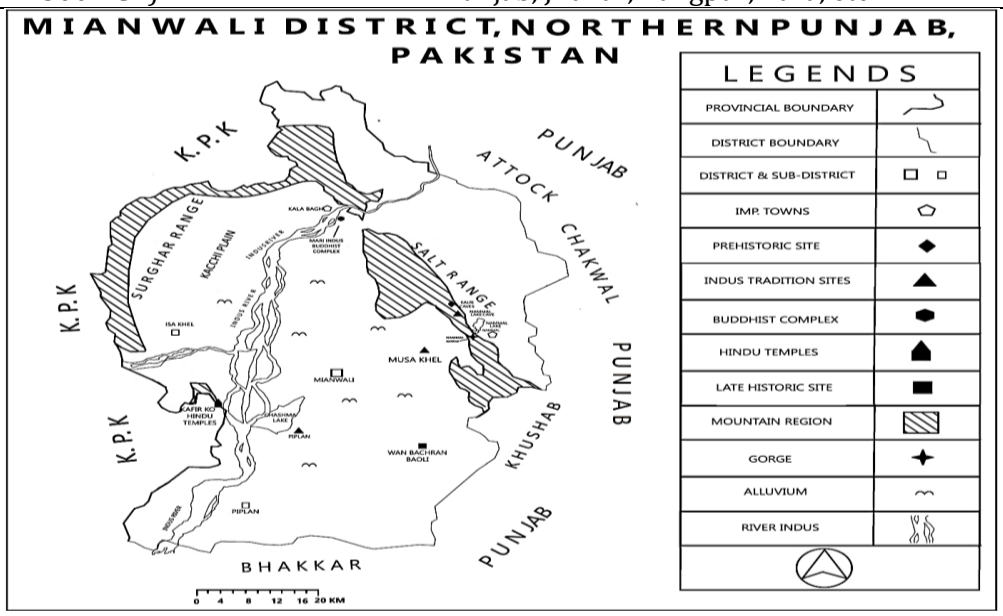


Figure 2: Map showing the Kacchi Valley, Mianwali District, with its geographical features, Musa Khel, and archaeological sites (Butt 2022).

Figure 3: A general view of the Musa Khel main mound from the western side, showing its disturbed condition (Butt 2022).

Results and Discussion

Musa Khel Flanged Vessels

Morphology

The morphological features of the current pottery type include a globular to slightly oblong body form with occasional perforated ring of varying height, width, and shape on the shoulder (Figure 4, Table 2). All specimens are fragmentary, and their complete shapes have been reconstructed through comparative studies. According to the classification method developed by Dales & Kenoyer (1986), which uses the metric system (i.e., the ratio between internal height (IH) and maximum body diameter (MBD)), most flanged vessels at Musa Khel fall into the "Pot" category. However, the possibility of categorizing some vessels as "Jar" cannot be excluded.

The rim and ring together form what is termed the flanged rim, characterized by the shape of the cavity between the ring and rim. The dominant rim form is simple perpendicular, while inverted and everted rim forms are rare. The rim lips are predominantly round to flat, with conical forms being rare. The rings are mainly everted, and the tips/lips of the rings are rounded to round flattened. The cavities between the ring and the rim are mostly concave and horizontally S-shaped, formed by a slight ledge at the juncture of the rim and neck. The rings are situated below the rim height. No vessels with bases have been preserved. Comparative studies indicate that both contiguous and non-contiguous flat bases are found in flanged vessels (Figure 5). Several flat bases reported from Musa Khel could be associated with this pottery type.

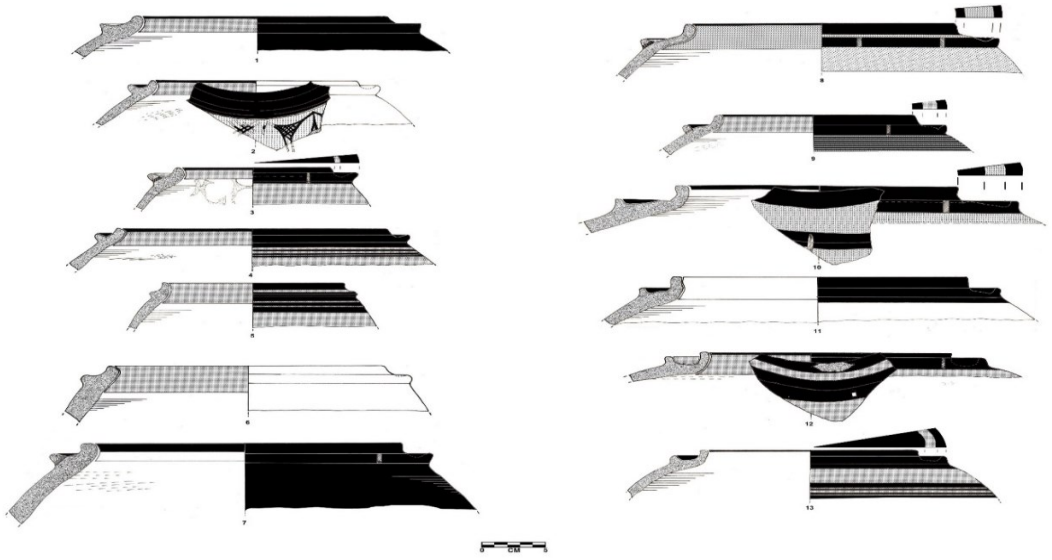


Figure 4: Variety of Musa Khel flanged vessels, showcasing the diverse range of morphology and decorative styles.

Table 2
Morphological Features

Serial No.	Figure No.	Functional Form	Ring & Rim Form	Body Form	Vessel Size	Section Size
1	4(1)	Pot, Flanged	Concave cavity b/w ring and rim, simple vertical rim with round lips.	Globular	Large	Thick
2	4 (2)	Pot, Flanged	Concave cavity b/w ring and rim, simple vertical rim with round lips.	Globular	Large	Medium

3	4 (3)	Jar (?), Flanged	Concave cavity b/w ring and rim, simple vertical rim with round lips.	Oblong	Medium	Medium
4	4 (4)	Pot, Flanged	Triangular/conical cavity b/w simple vertical rim with square lips.	Globular	Very Large	Medium
5	4 (5)	Jar (?), Flanged	Concave cavity b/w ring and rim, simple everted rim with square lips.	Oblong	Medium	Medium
6	4 (6)	Jar (?), Flanged	Concave cavity b/w ring and rim, simple everted rim with square lips.	Oblong	Very Large	Thick
7	4 (7)	Pot, Flanged	Concave cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Very Large	Heavy
8	4 (8)	Pot, Flanged	S walled cavity b/w ring and rim, simple vertical rim with round lips.	Globular	Very Large	Medium
9	4 (9)	Pot, Flanged	S walled cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Large	Thick
10	4 (10)	Pot, Flanged	S walled cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Very Large	Heavy
11	4 (11)	Pot, Flanged	Square shape cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Very Large	Thick
12	4 (12)	Pot, Flanged	Square shape cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Very Large	Thick
13	4 (13)	Pot, Flanged	Square shape cavity b/w ring and rim, simple vertical rim with square lips.	Globular	Large	Medium

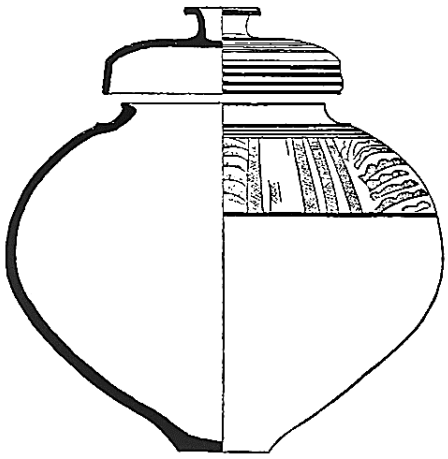


Figure 5: General Morphology of Flanged Jar (Allchin & Allchin 1982: Figure 8.5:198).

Morphological Variants

A series of morphological variations with oblong/globular bodies is evident in the current sample, and the following variants are suggested (Figure 6):

1. Semi-circular cavity between the ring and rim; round to pinched-plan ring; simple inverted rim with round lips.

2. Semi-circular to conical cavity between the ring and rim; square-plan ring; simple inverted to vertical rim with square lips and medium to heavy section sizes.

3. Semi-circular cavity between the ring and rim; round-plan ring; simple inverted to vertical rim with square lips and medium to heavy section sizes.

4. S-shaped cavity between the ring and rim; round to conical-plan ring; simple vertical rim with round to square lips.

5. S-shaped to square cavity between the ring and rim; square-plan ring; simple vertical rim with square lips; also a sharp ledge at the base of the rim.

6. Square cavity between the ring and rim; square to conical-plan ring; simple vertical rim with square lips.

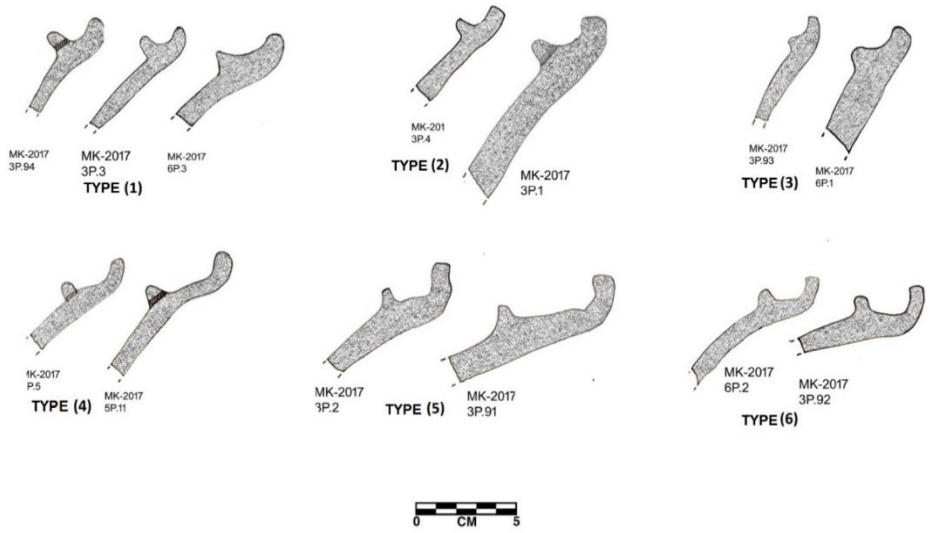


Figure 6: Morphological variation of flanged vessels from Musa Khel Collection.

Decoration

The decoration of Musa Khel flanged vessels demonstrates a consistent use of bands and slips, primarily in shades of reddish-black, dark reddish-gray, and red. The exterior of the vessels typically features one or more bands on the rim, flange, and sometimes beneath the flange. These bands are often dark reddish-gray or reddish-black in color, with slips ranging from pale brown to yellowish-red and various shades of red (Table 3). Generally, the decoration of these vessels reflects a uniform aesthetic with variations in the number of bands and the background slip color, creating a cohesive yet diverse set of flanged vessels.

Table 3
Decorative Features

Serial No.	Figure No.	Exterior Decoration	Interior Decoration
1	4(1)	Black painted/slipped (7.5 yr 2.5/1).	One band in black colour on rim continue from exterior; slipped with red color (10 r 4/4) in the background till throat.
2	4 (2)	One broad band on rim and one sharp band beneath the flange with design consists of hatched intersecting circles in reddish black color (10 r 3/1) with pale brown slip (2.5 y 8/2) in the background.	One band continue from exterior with red slip (10 r 4/6) in the background.

3	4 (3)	One dark reddish gray band (5 r 3/1) on rim and flange each while remaining portion is red slipped (10 r 4/6).	One band continue over top of rim with same slip.
4	4 (4)	One band on rim, one on flange and three sharp bands beneath the flange in dark reddish gray color (5 r 4/1) with yellowish red slip (5 yr 5/6) in the background.	One sharp band continue from exterior with same slip till throat. The remaining vessel is plain (5 yr 6/4).
5	4 (5)	One reddish black (5 r 2.5/1) bands; one on rim, one on flange and two below the flange while remaining vessel is red (10 r 4/6) slipped.	One band continue from exterior side over top of the rim and same slip till throat.
6	4 (6)	Traces of paint in very dusky red color (2.5 yr 2.5/2) on the whole body.	Traces of same paint till throat.
7	4 (7)	Completely painted with dark reddish gray color (10 r 4/1).	One band on rim in same color, with red slip (10 r 4/6) till throat.
8	4 (8)	One broad band on rim and flange each in dark reddish gray color (5 r 4/1), with red slip (10 r 5/6), between the flange and rim while pale brown slip (2.5 y 8/3) below the flange.	Red slip (10 r 5/6) applied till throat.
9	4 (9)	One broad band covering complete rim in reddish black color (2.5 yr 2.5/1) with red slip (10 r 4/6), one band covering flange till throat and seven sharp bands beneath the flange in same color with very pale brown (10 yr 8/2) slip in background.	One same color band continue from exterior with same slip till throat.
10	4 (10)	One broad dark reddish gray (5 r 3/1) band covering rim and throat and one band on the flange while remaining surface is pale yellow slipped (5 y 8/4).	One band on the rim continue from exterior with red slip (10 r 6/8) in the background.
11	4 (11)	Appear to be completely painted in dark reddish gray color (10 r 4/1).	Traces of dark reddish gray color (10 r 4/1) covering rim till throat.
12	4 (12)	One broad reddish black (5 r 2.5/1) band covering rim and throat; one band on the flange while remaining surface is red slipped (10 r 4/6).	One band on the rim with red slip.
13	4 (13)	Three band covering rim and flange and four sharp bands on shoulder in dark reddish gray color (7.5 r 3/1) with red slip in back ground covering remaining vessel (10 r 5/6).	One band on rim in dark reddish-brown color (7.5 yr 3/1) with red slip (10 r 5/6).

Decorative Variation

A series of decorative variations with color schemes is evident in the current sample, and the following variants are suggested:

1. Painted bands on the exterior of the rim and flange in dark reddish-gray to reddish-black, with a red to pale red slip (generally termed "black on red") in the background. Some specimens also feature multiple sharp lines in reddish-black on the main body and a reddish-black band with red slip on the interior throat region (Figure 7(1)).

2. Painted bands on the interior and exterior of the rim in reddish-black to dark reddish-gray, with red slip between the flange and rim and on the interior of the vessel. The main body has a very pale to pale brown slip (generally termed "black on white/creamy") (Figure 7(2)).

3. The entire vessel is painted in dark reddish-gray or black with matching color bands and a red slip on the interior of the rim (Figure 7(3)).

4. Dark gray to black bands on the exterior of the rim and flange with a pale brown (white/cream) slip in the background. One specimen, with a clear flanged vessel form, features intersecting circles with concave-sided hatched lozenges in dark gray on a pale yellow or creamy slip (Figure 7(4)).

Figure 7: Decorative varieties of Musa Khel Flanged Vessels.

Manufacturing

Flanged vessels at Musa Khel are primarily wheel-thrown and undergo various stages of manufacture. The main vessel is finished on the wheel, as indicated by horizontal grooves on both the interior and exterior surfaces. Large vessels require the use of base molds and hand modeling, which involves adding clay rings in addition to wheel modeling. As the vessel increases in size, it becomes necessary to construct it in multiple parts, as suggested by Wright. Large storage vessels, with heights of 60-70 cm, are produced in segments: the base and lower portions are formed using molds, and clay rings are added in parts on the wheel. The joints created by adding clay are smoothed on the wheel to achieve a symmetrical shape (Wright 1991:82).

In most specimens, the ring appears to be manufactured separately and attached to the vessel later. The ring is perforated with a pointed tool or straw, using slight pressing in a circular clockwise motion from bottom to top. It is possible that not every flanged vessel has a perforated ring. These rings are likely used to hold stoppers or lids, with perforations allowing strings to secure the lids, thus air-tightening the vessels and preventing leakage during transportation or storage. Sharp smoothing, resembling scraping, is a prominent finishing treatment observed on both sides of the vessels in the current sample. After the ring, slip is applied and painted designs and bands are added. Adding bands is accomplished while rotating the vessel on slow wheel. Once the decoration has dried, the vessel is fired in a kiln.

Composition and Firing

The current pottery type has a medium to heavy section size with sand inclusions ranging from 1% to 25%. The inclusions are predominantly poor sorted and exhibit textures ranging from “very fine to medium,” with occasional “coarse sandy” textures. Most pastes are composed of calcareous clays (Figure 8), very few have mixed calcareous and micaceous types (Figure 9) while micaceous paste (Figure 10) is rare. The paste color varies from light red (2.5 YR 6/6) to red (10 R 5/8), with rare instances of yellowish-red (5 YR 5/6). Some specimens exhibit signs of uncontrolled firing, such as a sandwich pattern in the core (Figure 8). In these cases, the core is light red to yellowish-red, while the margins range from light

brown to very pale brown. A few specimens show signs of bloating, indicated by tiny calcium carbonate spalls on the surface.

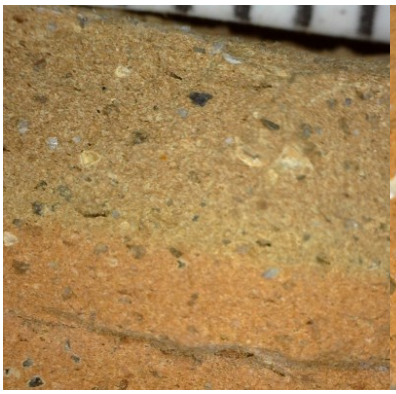


Figure 8: Partially oxidized paste with slight calcareous concretions.

Figure 9: Completely oxidized paste with abundant calcareous and few micaceous concretions.

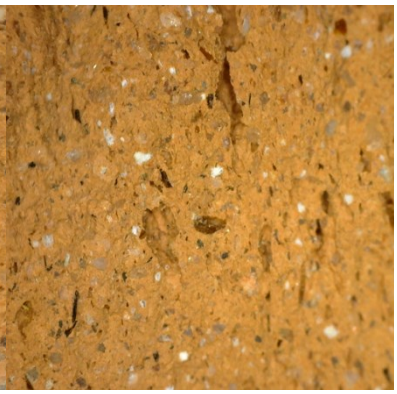


Figure 10: Completely oxidized micaceous paste.

Table 4
Different types of pastes used for the manufacture of flanged vessels, highlighting variations in inclusion types, textures, and firing.

Serial No.	Figure No.	Inclusions (%+sorting +Texture)	Overall Paste	Voids & Porosity of Paste
1	8	Approximately 10%; well sorted; "fine to medium sandy"	A slightly calcareous paste with the following main inclusions: brown (rounded to sub-rounded to angular), light gray (rounded to sub-rounded), pink with white streaks (sub-angular and medium), and white (rounded to sub-rounded to sub-angular).	Few tiny voids; porous
2	9	Approximately 15%; well sorted "very fine to fine", "medium" and "coarse sandy"	A paste with abundant calcareous concretions. The inclusions are black (sub-angular), brown (sub-rounded to sub-angular), white (sub-rounded to sub-angular), and yellowish white (sub-rounded).	Negligible voids; slightly compact
3	10	Approximately.25%; poorly sorted; "very fine to fine" and "medium sandy"	A paste with abundant micaceous inclusions. The main inclusions are black (very fine to fine, platy shape, abundant), white (very fine to fine, rounded to sub-rounded to sub-angular), green (sub-rounded), brown (sub-rounded), light gray (angular), and light pink (sub-rounded).	Few wide voids; porous

Production

The clay used for pottery production at Musa Khel appears to be sourced from nearby alluvial deposits, as the region is rich in alluvial soil, as illustrated in the map (Figure 2). The Indus River bed to the west also contains substantial deposits of suitable clay. Modern potters in Musa Khel village collect clay from local sources, specifically from their agricultural fields within a radius of approximately two kilometers, on a regular basis. Additionally, they obtain a special type of clay from the Musa Khel hills seasonally.

Several significant findings support the local production of pottery, including pottery wasters, terracotta cakes, and possible remains of pottery kilns and firing activities (Butt 2022). These findings bolster the likelihood that the clay was sourced locally. Paste

analysis and observations of contemporary pottery workshops further reinforce the probability of local production.

The identification of specific clay sources could be achieved through chemical analysis of soil samples from various sections of the study area, followed by comparison with the paste of Musa Khel pottery. However, such analysis is beyond the scope of the current study and is recommended for future research.

Temporal and Spatial Occurrence

Flanged vessels are extensively reported from the Greater Indus Valley and Baluchistan. They are primarily associated with the Kot Diji phase such as Ravi Plains (Wheeler 1947), Thal (Ghauri 2018), and Cholistan Desert (Mughal 1997) and type-site Kot Diji in the lower Indus Valley (Khan 1965).

Scant evidence also found at some sites from pre-Kot Diji phases, such as the Tochi Gomal phase in the Gomal Valley (Dani 1971; Durrani 1988; Jan 2012). Besides cuurent type continue to appear during the Late Kot Diji phase site in the Gomal Plains (Dani 1971; Durrani 1988), Tochi Valley (Khan et al 2000), and Pothohar (Mughal 1972a; Butt 2017; Butt 2020). Their occurrence is also witnessed during the Harappan phase in the Ravi Plains (Wheeler 1947), the Cholistan Desert (Mughal 1997), the lower Indus Valley (Alcock 1986; Sheikh et al 2004), and in trans-border regions towards the east (Lal 1979). Additionally, some examples are reported during the Early Harappan phase at Amri in Sindh (Casal 1964) and at Baluchistan Tradition sites in northern Baluchistan (Mughal 1972b).

Comparative Analysis

The comparative analysis of Musa Khel's flanged pottery types with those from Rehman Dheri, Gumla, and Sarai Khola (Table 5) provides a valuable perspective on the regional ceramic traditions and their temporal relationships within the broader context of Indus Valley and Baluchistan Tradition. The selected sites, Rehman Dheri, Gumla, and Sarai Khola are geographically proximate, exhibit long occupation, and have available radiocarbon dates, making them suitable comparatives for understanding Musa Khel's pottery.

Rehman Dheri, which spans three phases (RHD-I: Early Harappan Tochi Gomal phase, RHD-II: Kot Diji phase, and RHD-III: Late Kot Diji phase contemporary with Harappan phase), provides a useful comparative framework. Flanged rim vessels are noted in the RHD-II phase, though in limited number, and they become more pronounced in the late RHD-III phase, reflecting a late ceramic characteristic specific to this phase (Durrani 1988:64). This progression indicates an evolution in ceramic styles that is comparable with the findings at Musa Khel (see details in Table 5).

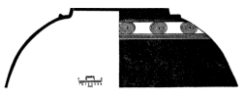
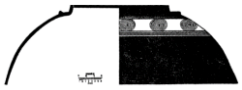
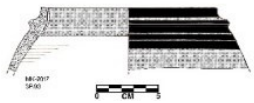
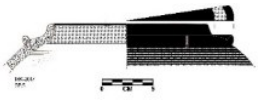
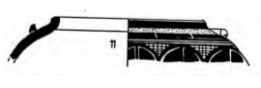
Gumla, with its six phases spanning from the Neolithic to the Gandhara Grave Culture phase (Dani, 1971), showcases a complex ceramic assemblage. Flanged vessels from Gumla appear in phases III (Early Kot Diji phase) and IV (Late Kot Diji phase contemporary with Harappan phase) with scanty evidence during GML-II, the Tochi Gomal phase. Musa Khel's flanged vessels are comparable to GML-III and GML-IV. Notably, the GML-IV phase (Late Kot Diji phase) displays significant variation of flanged vessels in shape and decoration, representing a blend of traditions rather than a single, coherent style (Kondo et al 2006:5). It is suggested the same presence exists at Musa Khel.

Sarai Khola reveals four developmental phases: SK-I (Neolithic), SK-IA (Transitional), SK-II (Kot Diji Phase), and SK-III (Early Historic Phase) (Mughal, 1972a). Shaffer refers to SK-I as the "Hakra Phase" (Shaffer 1992:445), while carbon dating of SK-II indicates a later development within the Kot Diji phase (Thomas & Allchin 1986:40-41).

Flanged vessels from the transitional and Early to Late Kot Diji phases at Sarai Khola correspond with similar pottery types found at Musa Khel, where these vessels appear alongside Harappan indicators such as perforated and parallel-sided heavy jars.

Therefor it is suggested that the flanged pottery types at Musa Khel are comparable to those of Sarai Khola's Phase IA and II, Rehman Dheri's Phase III, and Gumla's Phase III and IV. The pottery at Musa Khel reflects both early and late Kot Diji traits and shows coexistence with Harappan styles, indicating a dynamic cultural interactions and complex evolution of ceramic traditions in this region.

Table 5
Comparison of Morphological Features of Musa Khel Flanged Pots/Jars with Rehman Dheri, Gumla and Sarai Khola

Musa Khel	Rehman Dheri	Gumla	Sarai Khola
			-
	RHD III (Durrani 1988: Fig. 20, no.2, p.168).	Gumla III (Dani 1971:Fig.19, no.160).	-
		-	
	RHD III (Durrani 1988: Fig. 22, no.8, p.170)	-	SK II (Mughal 1972 a: Fig. 16, no.90, p.64).
			
	RHD III (Durrani 1988: Fig. 22, no.4, p.170)	Gumla IV (Kondo et. al 2006:Fig.2, no.30, p.7).	SK II (Mughal 1972 a: Fig. 16, no.90, p.64).
		-	
	RHD III (Durrani 1988: Fig. XXI, no.9, p.169).	-	SK IA (Mughal 1972 a:Fig. 15, no.82, p.63).
			-
	RHD III (Durrani 1988: Fig.23, no.8, p.171).	Gumla III (Dani 1971:Fig.19, no.152).	-
			
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	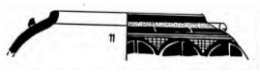		
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	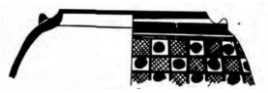		-
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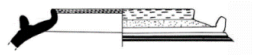
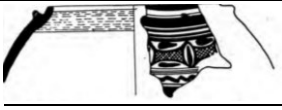
		-	-
	(Durrani et al 1991:Fig. 11, no.13, p.62).	-	-
			-
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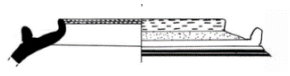
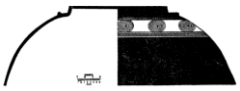
		-	
	(Durrani et al 1991:Fig. 11, no.13, p.62).	-	(Mughal 1972 a: Fig. 16, no.90, p.64).
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	RHD III (Durrani 1988: Fig. 21, no.2, p.169).	-	-

Conclusion

Musa Khel, an important site of the Indus Tradition, has yielded a diverse range of craft traditions, with pottery holding a prominent position. Among the various pottery types identified at Musa Khel, flanged jars and pots are particularly noteworthy due to their production techniques and widespread occurrence throughout the Greater Indus Valley.

The flanged vessels from Musa Khel exhibit considerable variation in morphology, decoration, and composition. Most of these vessels feature a globular to oblong body with perforated flanges of different styles. Decorative schemes include black-on-red, black-on-creamy white, and combinations of black on both red and creamy white. Wide and sharp black bands are also common, with the primary decorative motif being hatched lozenges. Many of the vessels are large and thick-walled. The paste used is typically very fine to medium and includes calcareous and micaceous inclusions. Finishing is achieved through smoothing with rotation, as indicated by horizontal striations on both sides of the vessels. The pottery is produced in multiple stages, involving both wheel and hand techniques, and is ultimately finished on the wheel. The presence of complete oxidation in the current sample suggests precise control of the firing process at Musa Khel. Ethnographic observations and archaeological evidence, such as melted pottery specimens, indicate that these flanged vessels were produced locally.

Flanged vessels are prominently found throughout the Indus Civilization and were especially popular during the early Harappa Kot Diji phase. They have also been reported from pre-Kot Diji phase levels at a few sites, such as Gumla and Gandi Umar Khan, though

evidence is limited. In the northwestern borderland region, flanged vessels are present during the Late Kot Diji phase. Sites like Harappa, Mohenjo-Daro, and Lothal continued to feature these vessels during the Harappan phase.

Comparative analysis shows that the chronology of flanged vessels at Musa Khel is similar to that at nearby sites like Gumla and Rehman Dheri in the Gomal Valley, located in the trans-Indus zone and Sarai Khola, located in the trans-Salt Range zone. The presence of these vessels at Musa Khel suggests a distribution link between the core Early Harappan Zone (Gomal and Tochi Valley) and the Harappan Zone (Central Indus Plains) and co-existence of different ethnic groups.

Recommendation

The widespread occurrence of flanged vessels over an extended period and across various locations necessitates further investigation. This study could provide insights into the origins and dissemination of these vessels throughout the Greater Indus Valley. The Gomal Valley, Tochi Valley, Salt Range, and Pothohar Plateau are potential regions where these pottery items may have first been produced.

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