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A BUDDHIST TOWN AT SEERAJ IN UPPER SINDH (KHAIRPUR, PAKISTAN): HISTORICAL, CHRONOLOGICAL, ARCHAEOMETRICAL AND ARCHAEOBOTANICAL ASPECTS

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Abstract

The town of Seeraj (Sheraz) is located along the central-western fringes of the Rohri Hills in Khairpur district of northern Sindh. The site is almost unknown to archaeologists, and has never been mentioned in the literature that deals with the monumental sites of Sindh of the Buddhist period. During a series of preliminary surveys carried out in the area, potsherds and archaeobotanical remains were collected for scientific analyses. The radiocarbon date obtained from a charcoal sample indicates that Seeraj was destroyed during the first half of the Eighth century AD when the Arabs conquered Upper Sindh. The scientific analysis of a number of specific ceramic potsherds and bangles has provided us with the first information on the technology employed in pottery manufacture. The anthracological identifications indicate that most of the material analysed comes from structures that can be attributed to private and public constructions.

1. Preface (P.B.)

The Buddhist town of Seeraj[1] (or Sheraz) is located along the central-western fringes of the limestone terraces of the Rohri Hills in the Khairpur District. More precisely it lies on two flat hilltops (A and B) some 120 m high, separated by a saddle, some 1,750 m northeast of the Tomb of Uban Shah (Fig. 1). To the east and to the west of the town, two small seasonal streams flow in southeast-northwest direction. The geographic coordinates of the site (Hill A) are: 27°21'55" Lat. N. and 68°47'00" Long. E.

A. JAFRI (1980) was the first to report the existence of the town in his M.A. Thesis[2]. This author gave a first description of the area, and drew a plan of the site (Fig. 2), which he interpreted as *"a perfectly planned small township with the clear distinction of living quarters and other amenities"* (JAFRI, 1980: 3). He also described some buildings, and pointed out the presence of *"traces of construction on three corners of the rock, which resemble to security posts"* and that of *"a smaller complex of rooms with thick walls of burned bricks"* along the western end of the terrace, while the *"central area of the hill accommodates a flat construction identical to a speakers stage or salute platform"* (JAFRI, 1980: 4).

Further details of the city stone foundations were later provided by G.M. SHAR (1995: 37), who reported the occurrence of *"visible remains of a massive stone wall" "on a hill top, immediately to the East of Seeraj-ji Takri"*, which might represent an ancient fortification, on Hill B. *"On Hill A, remains of domestic architecture consisting of lime-plastered walls built of burnt and plain mud bricks ......A heap of burnt bricks was also noticed, of which some were carved in the same fashion as those known from Sindhi Buddhist stupas"* (SHAR, 1995: 112).

G. Verardi, who paid a visit to the site in 1987, observed that it was composed of *"an inhabited area and a sacred area"* and that this latter included *"a stupa...almost completely deprived of its outer casing of carved baked bricks"* (VERARDI, 1987: 50), a few of which were later mentioned also by F.M. BUKHARI (1998-99: 27).

Apart that from these, the town of Seeraj has never been cited by any of the authors who have addressed their interests to the Buddhist

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[1] The site is mentioned by G.M. SHAR (1995) with the name of Seeraj-ji Takri (Seeraj Hill). The name Seeraj means oil lamp both in Sindhi and in Hindi. A similar name is also reported by BLANFORD (1880: 108), when he describes the presence of *"two limestone hills called Maleki Khánwári and Sherawári Tekri"* near the village of Mithunjo along the central western margin of the Rohri Hills.
[2] This author mistakenly links the name of Seeraj to that of Seorai (LAMBRICK, 1973: 141), a fortress whose ruins were still visible in the mid Eighteenth Century in a mound near Sabzal Kot (RAVERTY, 1979: 342)

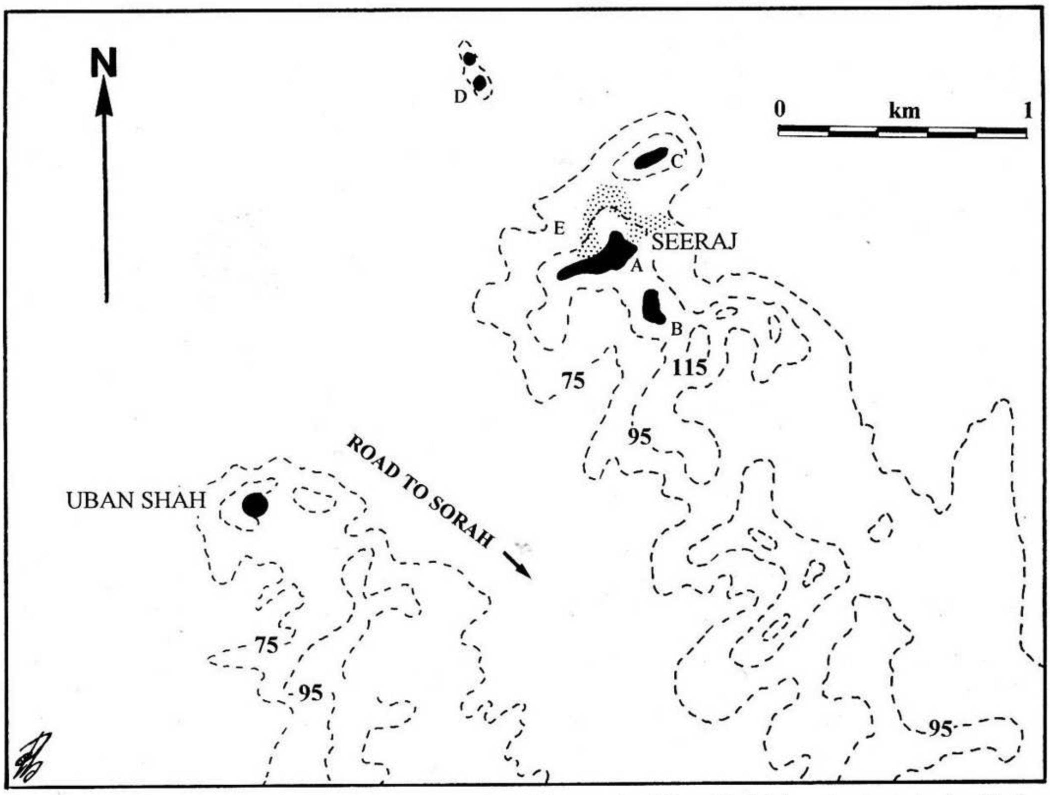

Fig. 1 - Seeraj: location of the Buddhist town northeast of the Tomb of Uban Shah (elevation in metres), with the indication of the two Hills A and B. Other *in situ* archaeological remains are in black. The dotted area (E) indicates the northern slope of Hill A, where habitation structures were observed through aerial photograph interpretation (*drawn by P. Biagi*).

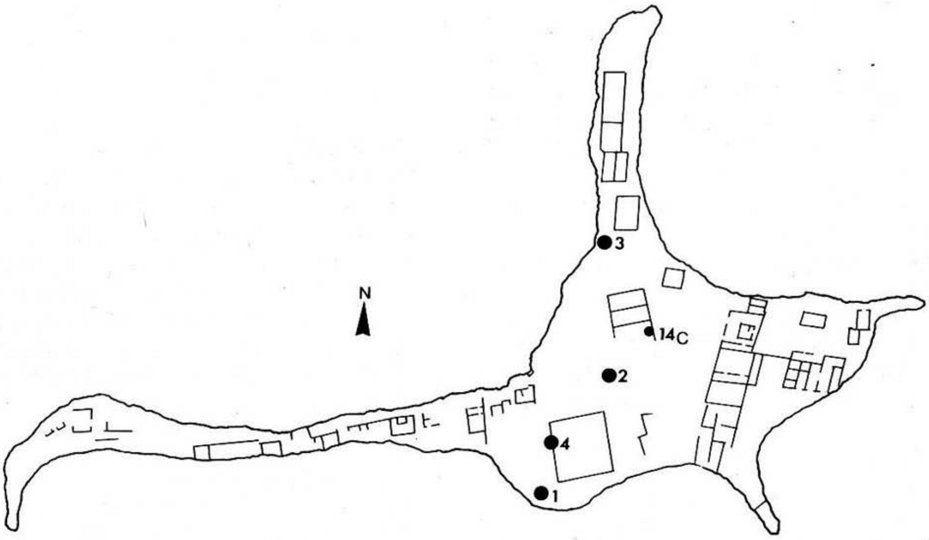

Fig. 2 - Seeraj: plan of Hill A with the location of the points from which were collected samples for macrobotanical identification (1 to 4) and charcoals for radiocarbon dating (14C) (*redrawn by P. Biagi from* JAFRI, *1980*).

monumental sites of Sindh (COUSENS, 1929; MAJUMDAR, 1934; VAN LOHUIZEN, 1981; BALL, 1989). Furthermore, following Ptolemy, there is no mention of cities just to the south of Aror (Kamigara) even in the immediately preceding historical times (MCCRINDLE, 2000: 151).

The writer repeatedly visited the site since 1986, when a preliminary archaeological survey of this part of the Rohri Hills was carried out in search for Palaeolithic sites, which were in effect discovered close to the Seeraj hill (BIAGI and CREMASCHI, 1988: 424). During this first visit, the remains of a squared construction, corresponding to Verardi's stupa (Plate 1, n. 1) were observed, as well as those of a few rectangular stonewalled rooms (Plate 1, n. 2) and of mud-brick walls (Plate 1, n. 3). Other visits were later paid in 1996, 1999 and 2001, when the historical town had already been partly destroyed by impending limestone quarrying and industrial works. Many fragments of ceramic vessels were collected during these visits and are now in the stores of the Department of Archaeology of the Shah Abdul Latif University, Khairpur.

A preliminary interpretation of the aerial photographs of the area, made by C. BARONI (pers. comm. 1999) in 1999, revealed the presence of many habitation structures along the northern slope of Hill A (Fig. 1, E), which had evidently been removed during the industrial works carried out between the 1950s, when the aerial photographs had been taken, and the 1980s. The photographs showed that the town extended well beyond Hilltops A and B, and that it had been almost completely destroyed in the last decades. For this reason a brief survey was carried out in the lower-lying desert alluvial plain, which extends just to the north of the ancient town. It revealed the existence of two circular stone structures, some 1 km north-northwest of Hill A (Fig. 1, D), which might be related to the ruins of Seeraj. Furthermore, the interpretation of the aerial photographs of another flat hilltop, northeast of Hill A, revealed the presence of archaeological remains (Fig. 1, C).

On January 15th of the same year, one charcoal sample was collected from the foundations of a mud-brick wall located northeast of the stupa (Fig. 2, 14C). The charcoals were identified by R. Nisbet as

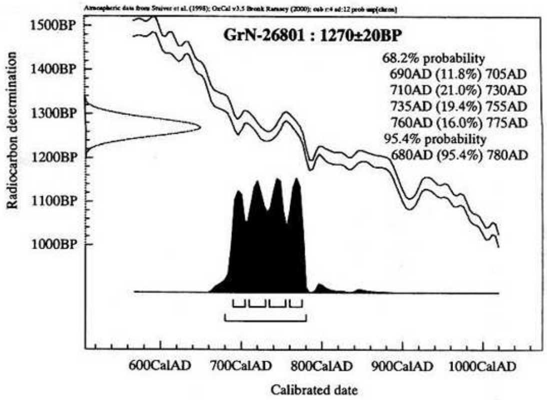

Fig. 3 - Seeraj: calibrated radiocarbon date GrN-26801, according to OxCal v3.5.

belonging to *Acacia* sp., and radiocarbon dated to 1270±20 BP (GrN-26801), which corresponds to 690-775 AD at 1σ and to 680-780 AD at 2σ (Fig. 3) (STUIVER *et al.*, 1998). This result indicates that the town was destroyed during the first half of the Eighth Century AD, or slightly later, most probably during the sovereignty of the Umayyad Khalifas (PANHWAR, 1983), possibly as a consequence of the Arab invasion[3].

The last survey was carried out on January 30th, 2001, when charcoal samples for anthracological identification were collected from four distinct points of Hill A (Plate 1, n. 4) together with fragments of plaster from the western wall of the stupa (Plate 1, n. 1). A sample of ceramic potsherds was also collected from the stupa area, for the scientific analysis of the raw material sources employed in pottery manufacture.

2. The pottery assemblage

2.1. The typological characteristics (P.B.)

As reported by VERARDI (1985: 50) the pottery assemblage from the surface of the site includes four main classes of red, red polished, painted and grey wares. G.M. SHAR (1995: 156) attributes the ceramics from Seeraj to three different periods, Trihni, Early and Middle Historic, although he also mentions the presence of a few Late Indus potsherds. The only scientific analysis so far conducted on a ceramic

[3] Nothing is known of the story of this town from the literature. The only available source is that of the Chachnamah (KALICHBEG FREDUNBEG, 1990: 13) where it is reported by the author himself that "*my name is Chach son of Selâij, Brahman. My brother Jandab and my father live in a temple in a rural place attached to the town of Alór, and pray for Rai Sâhasi and the chamberlain Râm*". The same story is also mentioned by LAMBRICK (1973: 156). According to G. VERARDI (*in litteris* 4.08.2002) "*it is more reasonable that the town was destroyed by the Brahmans, although this is difficult to demonstrate*". See also VERARDI (1996: 240).

vessel from this site, is that of one single bottom sherd collected in 1996, which produced remains of wine residues (GYULAI and KÁLLAY, 1998-99).

The potsherds collected during the January 2001 survey seem to constitute a homogeneous assemblage. They all come from the stupa area. The 22 samples (Plates 2 and 3), which have been analysed in thin section are described according to their typological shape, and outer surface colour[4].

SRJ 1 (Plate 2): body fragment of hemispherical (?) vessel with polished, dark reddish brown (2.5YR 3/6), slipped surfaces;

SRJ 2: fragment of large open dish, with concave walls and out-turned thickened rim. Light brown (7.5YR 6/4) surfaces;

SRJ 3 (Plate 2): body fragment of large, hemispherical (?) vessel with oblique striations below a horizontal grooved line. Yellowish red (5YR 5/6) surfaces;

SRJ 6 (Plate 2): rim fragment of deep, conical bowl of pale brown (10YR 6/3) ware;

SRJ 8 (Plate 2): fragment of deep, hemispherical vessel with out-turned, flat rim, decorated with patterns of oblique, incised lines and impressed triangles. Reddish brown (5YR 5/4) surfaces;

SRJ 9 (Plate 2): fragment of open bowl with vertical, thickened rim decorated with 'V' shaped impressed motifs on the external surface of light reddish brown colour (5YR 6/4) and convex body;

SRJ 10 (Plate 2): fragment of red (2.5YR 4/8) slipped, necked jar with two black painted horizontal bands;

SRJ 11 (Plate 2): fragment of necked jar with three black painted horizontal bands. Red (2.5YR 4/8) surfaces;

SRJ 12 (Plate 2): red (10R 4/6) slipped, lower body fragment of probable smoking pipe with thickened internal surface;

SRJ 13 (Plate 3): fragment of carinated vessel with parallel, white painted bands and floral (?) black painted motifs in the lower part. Reddish yellow (5YR 6/6) surfaces;

SRJ 14 (Plate 3): lower body fragment of large, open vessel with red and black horizontal, painted bands. Light brown (7.5YR 6/4) surfaces;

SRJ 15 (Plate 3): fragment of hemispherical (?), deep open vessel with two parallel, black painted bands below a red painted (2.5YR 5/6) surface. Light brown (7.5YR 6/4) surfaces;

SRJ 18 (Plate 2): bottom fragment with internal mushroom-shaped protuberance. Reddish brown (5YR 5/4) surfaces;

SRJ 20 (Plate 3): body fragment of large, deep vessel with "tree" plastic motifs. Red (2.5YR 5/6) surfaces;

SRJ 21 (Plate 3): fragment of convex body sherd with oval-shaped plastic, impressed decoration. Reddish brown (5YR 5/4) surfaces;

SRJ 22 (Plate 3): fragment of probable bangle with oval-shaped section. Light brown (7.5YR 6/4) surfaces;

SRJ 25 (Plate 2): fragment of large weak red (10R 4/4) slipped, hemispherical (?), deep vessel with horizontal, black and white painted bands. Red (2.5YR 5/6) surfaces;

SRJ 26 (Plate 3): fragment of bangle with circular section. Very pale brown (10YR 7/4), red panted surfaces;

SRJ 27 (Plate 3): body fragment of large, red slipped, hemispherical (?) vessel with one black painted band. Light brown (7.5YR 6/4) surfaces;

SRJ 28 (Plate 3): body fragment of large vessel with plastic cordon, obliquely impressed decoration. Reddish brown (5YR 5/4) surfaces;

SRJ 29 (Plate 2): fragment of necked jar with thickened rim. Red (2.5YR 5/6) surfaces;

SRJ 32 (Plate 3): fragment of deep, hemispherical vessel decorated with horizontal and wavy, grooved patterns. Light reddish brown (5YR 6/4) surfaces.

[4] The colours are those of the MUNSELL SOIL COLOR CHARTS (2000).

2.2. The scientific analyses (M.S.)

2.2.1. The thin sections

Twenty-two potsherds, mainly collected from the area close to the north-western corner of the stupa, near a mud-brick wall, were analysed in thin section (Plates 2 and 3). Six different fabrics were identified (Table 1). In addition, one sample of plaster from the western wall of the stupa was also analysed (Plate 7).

G1 - (1 sample: SRJ 1: Plate 4, top)

Reddish, very fine, vitrified matrix with very fine and well-sorted quartz (<3%; typical size 0.03 by 0.02 mm), fine muscovite mica (1%), and iron oxides (3%); a red slip is present;

Sub. a - (1 sample: SRJ 29)

Reddish, fine, vitrified matrix, identical to that of G1, with some coarser quartz grains (5%; size range between 0.4 by 0.2 and 0.05 by 0.02 mm) and one fragment of rock, probably tourmaline[5]; a yellow slip is present.

G2 - (14 samples: SRJ 3 [Plate 4, bottom], 6, 8, 9, 10, 11, 13, 15, 18, 20, 21, 25, 28, 32)

Reddish, vitrified matrix with abundant angular and subangular quartz (up to 30%; range size between 1.5 by 1.0 and 0.04 by 0.03 mm), feldspar (>3%), muscovite and biotite micas (3%), occasional amphibole, some iron oxides (5%), pyroxene (3%), occasional clinopyroxene, some subrounded limestone, angular tourmaline rock fragments (<2%), rare flint (1%), opaques, rare polycrystalline quartz and microfossils (e.g. SRJ 10). A few samples contain some re-worked alluvium (e.g. SRJ 3 and 11). Two samples (SRJ 8 and 10) show a red slip;

Sub. a - (2 samples: SRJ 14, 27)

Red, very fine, vitrified matrix with angular and subangular quartz (10%; range size between 0.2 by 0.15 and 0.07 by 0.05 mm), occasional feldspar, rare microcline, very long muscovite (2%) (length up to 1.5 mm) and thick lamellae of biotite micas (2%), abundant pyroxene (>2%), occasional subrounded limestone fragments (1%; typical size 0.1 by 0.06 mm), rare angular tourmaline rock fragments (sample SRJ 14), iron oxides (5%), and occasional opaques.

G3 - (1 sample: SRJ 12: Plate 5, top)

Brown-reddish, micaceous, very fine matrix with very fine and well-sorted angular and subangular quartz (5%; typical size 0.03 by 0.02 mm), iron oxides (3%), fine muscovite mica (2%), and occasional opaques. It also shows some re-worked alluvium, which is naturally present in the fabric.

G4 - (1 sample: SRJ 26, bangle: Plate 5, bottom)

Brown, micritic, slightly fossiliferous matrix with abundant poorly-sorted quartz (15%; range size between 0.1 by 0.06 and 0.05 by 0.03 mm), muscovite mica (2%), rare biotite, occasional pyroxene and feldspar, some opaques, iron oxides (<3%), and abundant fine and rounded limestone fragments (10%; typical size 0.05 by 0.04 mm). Occasional microfossils.

G5 - (1 sample: SRJ 22, bangle: Plate 6, top)

Light brown vitrified matrix characterised by artificially mixed clays (red non-calcareous clay strips and brown micritic clay) with abundant well-sorted angular and subangular quartz (20%; typical size 1.1 by 0.6 mm), long and thick lamellae of muscovite (2%) and rare biotite (1%) micas, some feldspar (>2%), occasional pyroxene, some fine subrounded limestone fragments (<2%), rare tourmaline rock fragments, occasional opaques and iron oxides (3%).

G6 - (1 sample: SRJ 2)

Brown vitrified, slightly micritic matrix with abundant and poorly-sorted subangular and subrounded quartz (25%; size range between 1.3 by 0.8 and 0.03 by 0.02 mm), abundant feldspar (>3%), some pyroxene (2%), rare amphibole, polycrystalline quartz and flint, muscovite and biotite micas (2%), some limestone fragments (4%; size range between 1.75 by 1.12 and 0.25 by 0.1 mm), some red clay chunks (2%), occasional angular tourmaline rock fragments, opaques and abundant iron oxides (5%), and some microfossils.

One sample of plaster (SRJ 100a; Plate 7) from the western wall of the Buddhist stupa was also analysed. It is characterised by a brown-reddish, slightly micritic matrix, with poorly-sorted angular and subangular quartz (15%; range size between 0.1 by 0.08 and 0.03 by 0.02 mm), abundant oval and very elongated voids left by organic material (15%), cellular structures of (probably) *parenchymatous tissue* and some cereal phytoliths (MACPHAIL, pers. comm.

[5] Its formation is possibly due to post-depositional factors. It might also be a zeolite mineral, typical of the breakdown of volcanic areas or other unstable components from volcanic rocks (DITCHFIELD, pers. comm. 2002).

Microscopic analysis of the ceramic inclusions																										
		Quantity			Size			Quartz																		
Sample	Description of the matrix and notes	Abundant	Medium	Scarce	Very fine	Fine	Medium	Angular	Subangular	Polycrystalline	Flint	Aeolic	Feldspar	Plagioclase	Muscovite	Biotite	Calcite	Pyroxene	Amphibole	Opaques	Rock fragm.	Clay pellets	Iron oxides	Limestone	Radiol. Chert	Microfossil
SRJ1	reddish, very fine; red slip			X					P						P								P			
SRJ2	brown, calcareous, micaceous; orthoclase; tourmaline; some red clay chunks	X					X	A	VA	R	R		A	P	A	P	R	P	R	P	P		P	P		R
SRJ3	reddish vitrified; tourmaline; some re-worked alluvium	X					X	VA	A		P		P	P	P	P		A	P	P	P		P	P		
SRJ6	brown-reddish micaceous, virified; tourmaline; some re-worked alluvium	X					X	VA	A				P		P	P				P	P		P			
SRJ8	brown-reddish micaceous vitrified; tourmaline; red slip	X					X	VA	A	R	R		A	P	P			P	P	P	R		P			
SRJ9	red vitrified; tourmaline	X					X	A	A		R		P	P	P	P		A	P	P	R		P	P		
SRJ10	reddish, very fine, vitrified, very long mica; red slip		X				X	A	A				P		P			P					P	P		R
SRJ11	brown, vitrified, micaceous; very long muscovite mica; some re-worked alluvium	X					X	VA	VA	R	P		A		A	P		P	P	P	R		P	P		R
SRJ12	brown-reddish vitrified micaceous; re-worked alluvium; post-depositional limestone		X			X		P	P						P			R					A			
SRJ13	brown-reddish vitrified; very thick biotite; post-depositional limestone	X					X	VA	A		R		A		P	P		P		R			P	P		
SRJ14	brown-reddish micaceous vitrified; very long muscovite; microcline; tourmaline		X				X	A	A	R			P							P	R		P	R		
SRJ15	brown-reddish vitrified; post-depositional limestone	X					X	VA	A				A		P			P	P	R			P	P		
SRJ18	brown-reddish vitrified	X					X	VA	A		P		A		P			P	P	P			P	P		
SRJ20	brown-reddish, micaceous, vitrified; microcline	X					X	VA	A		R		P	P	P			P						P		
SRJ21	brown-reddish, micaceous, vitrified	X					X	VA	A	R			A		P	P		P	P	P			P	P		
SRJ22	light brown and red clay strips; mixed clays; slightly micritic	X					X	VA	A				P		P	P		R		P			P	P		R
SRJ25	reddish vitrified; tourmaline	X					X	VA	A		R		P		P	P		R	R		P		P			
SRJ26	(bangle) yellow-brownish micritic	X				X		VA	A				P		P	R		R		P			P	A		R
SRJ27	brown-reddish vitrified; post-depositional limestone		X				X	A	A				R		P	P			P	R		P	P			
SRJ28	brown-reddish vitrified; slip; post-depositional limestone	X					X	VA	A		P		P		P				R	R			P	R		R
SRJ29	reddish, vitrified; yellow slip; tourmaline (?), it could be due to post-depositional factors, or zeolite			X	X			P	P						R						R		P			
SRJ32	brown vitrified; tourmaline; very thick and abundant biotite	X					X	VA	A	R	R		A	P	P	A		P	P	P	P		A			
SRJ 100a	(fragment of a temple's wall; mud brick) brown-reddish, slightly micritic, abundant organic temper-cereals	X				X		A	P				R		P	R		P		P			P	P		R

Table 1 - Seeraj: thin section analysis of potsherds and plaster. Very abundant (VA), abundant (A), present (P), rare (R).

2002), one microfossil, some naturally present rounded limestone fragments (typical size 0.2 by 0.15 mm), some muscovite (2%), and rare biotite micas. Some limestone due to post-depositional factors is present in the voids and along the edges of the fabric.

2.2.1.1. The group characteristics

Group 1 is characterised by a very fine, reddish, vitrified matrix with very small, rare inclusions such as quartz, muscovite, iron oxides, and the occurrence of a red slip. Its *subgroup a* shows a fine matrix identical to that of G1, although with a yellow slip, some coarser quartz grains and one (probable) tourmaline rock fragment (see footnote 5).

The matrix of group 2 shows similarities with that of G1, even though it is more micaceous and iron-rich. It also shows some rounded and subrounded fragments of polycrystalline limestone, which are absent in G1. It is characterised by artificial addition of inclusions (temper) to make the paste less plastic. The temper consists of abundant sandy-quartz, probably collected from a river (I. FREESTONE, pers. comm. 2002). It is composed of abundant angular and subangular quartz, feldspar, pyroxene (also clinopyroxene), some tourmaline rock fragments, white and brown micas, rare flint, amphibole and polycrystalline quartz, limestone fragments and microfossils. Only two samples show a red slip. Some limestone, due to post-depositional factors, is also present along the edges of a few sherds. Its *subgroup a* has the same fine, iron-rich, micaceous, non-calcareous matrix with rare naturally present rounded fragments of polycrystalline limestone, a lower percentage of detrital fraction characterised by very long muscovite mica, and rare microcline. It does not contain any flint.

The fabric of group 3 is different from those of G1 and G2: it is very fine, less iron-rich and shows some re-worked alluvium (MACPHAIL, pers. comm. 2002). It does not contain any temper. The clay must have been decanted in order to obtain such a very fine and pure matrix (as for G1).

Group 4 is very different from the previous three groups, because of its very micritic matrix in contrast with those of groups 1, 2, and 3, which are non-calcareous. The detrital fraction is composed of abundant quartz, feldspar, micas, rare pyroxene, opaques and iron oxides, and naturally present fine, rounded limestone fragments. The size of the grain minerals is finer than those present in the temper of group 2. It also contains some microfossils.

Group 5 is the only sample characterised by artificially mixed clays (brown and red strips of clay) with a rich detrital fraction composed of well-sorted quartz, feldspar, occasional pyroxene, some limestone fragments, iron oxides and opaques, biotite and thick lamellae of muscovite micas. Group 6 shows an alluvial clay slightly micritic and fossiliferous with alluvial temper; probably some of the limestone is naturally present in the matrix, some was part of the added river sand.

The plaster (SRJ 100a) looks like a typical mud-brick because the temper shows straight edge voids, and mineralised organic traces (MACPHAIL, pers. comm. 2002).

The potters, who manufactured the vessels for the Buddhist town of Seeraj, exploited at least six sources of clay. Three of these (groups 1-3) are very fine and non-calcareous. G1 has a very red, fine and slightly micaceous matrix; G2 a red, fine but more micaceous and iron-rich matrix with some rounded limestone fragments; whereas group 3 shows also some re-worked alluvium. The matrixes of groups 5 (a mixture of calcareous and non-calcareous clays) and 6 are slightly micritic, and/whereas G4 is very calcareous.

Groups 1 and 3 do not show any temper, while non-plastic inclusions were added to groups 2, 4, 5 and 6. Therefore, the potters used two sources for the manufacture of the fabrics of groups 2, 4, 5 and 6: the first for the clay and the second for the temper (e.g. as regards groups 2 and 2 *sub. a*, the first source was a reddish, fine clay characterised only by silty material - the finest mica is probably natural part of the clay - and the second was the temper probably collected from a river).

The added inclusions of group 2 are varied, rather coarse and abundant, with some flint as in G6 (G2 *sub. a* does not contain any flint). The temper of group 4 is finer, less abundant and better sorted than that of G2. The inclusions are similar, although they are present in different size and percentage (e.g., quartz, feldspar, pyroxene and micas; no flint or rock fragments). The temper of group 5 is coarser than that of G4, but finer than that of G2 and shows tourmaline rock fragments as in G2. Group 6 is characterised by similar inclusions (with tourmaline), very poorly sorted, with more lumps of limestone and grains coarser than those of the preceding groups 2 and 5.

On the basis of the similarities of the non-plastic minerals, it is possible to suggest that the temper utilised for the production of groups 2, 4, 5 and 6 was collected from different areas of the same river system (FREESTONE, pers. comm. 2002).

The clay of SRJ 100a (plaster) was probably

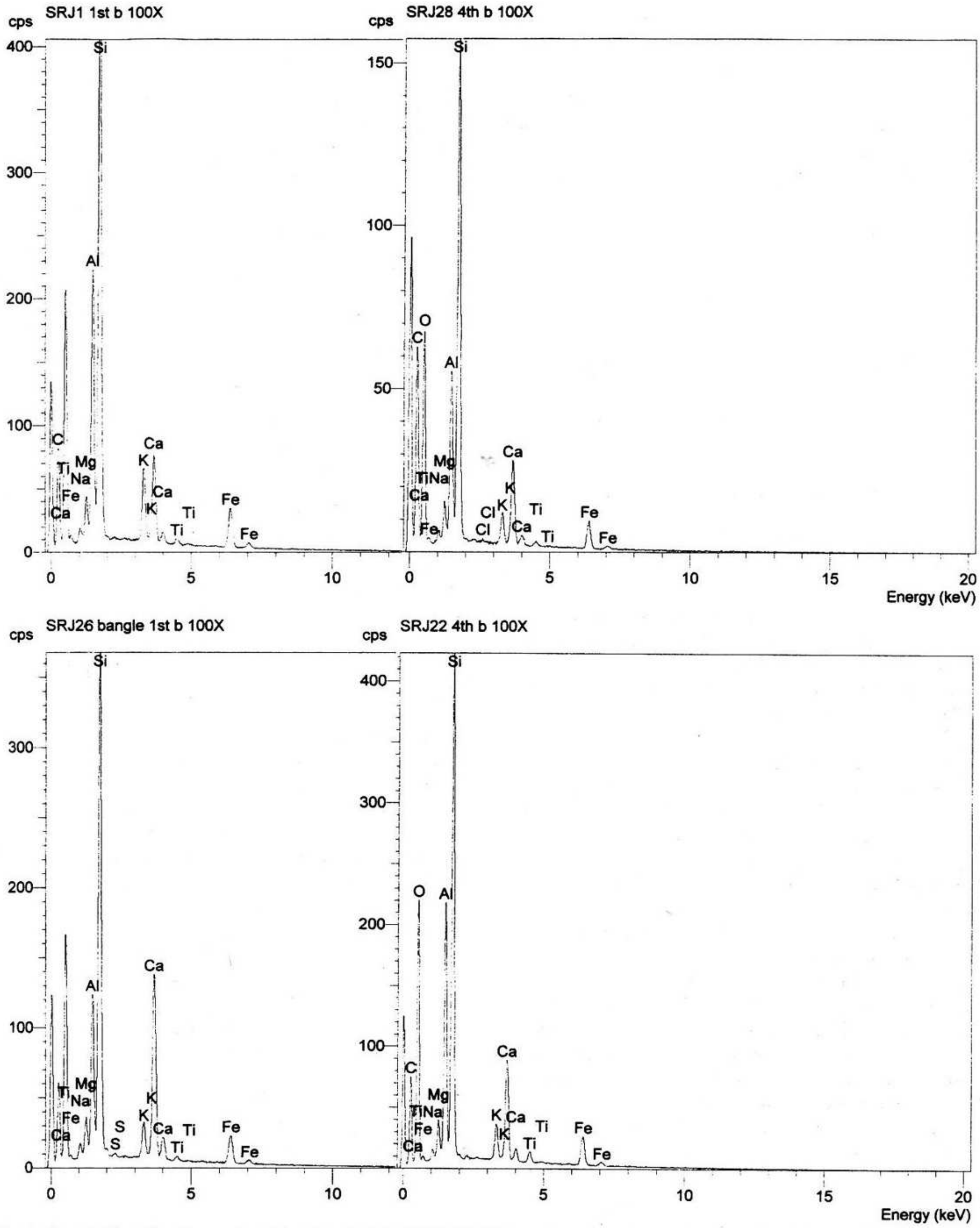

Fig. 4 - Seeraj: identification peaks defined by SEM-EDS (JEOL JSM-35 CF with a standard peak of resolution of 138 eV) analysis of SRJ 1 (G1; first bulk analysis at 100X) (top left), SRJ 28 (G2; fourth bulk analysis at 100X) (top, right), SRJ 26, bangle (G4; first bulk analysis at 100X) (bottom, left) and SRJ 22, bangle (G5; fourth bulk analysis at 100X) (bottom, right).

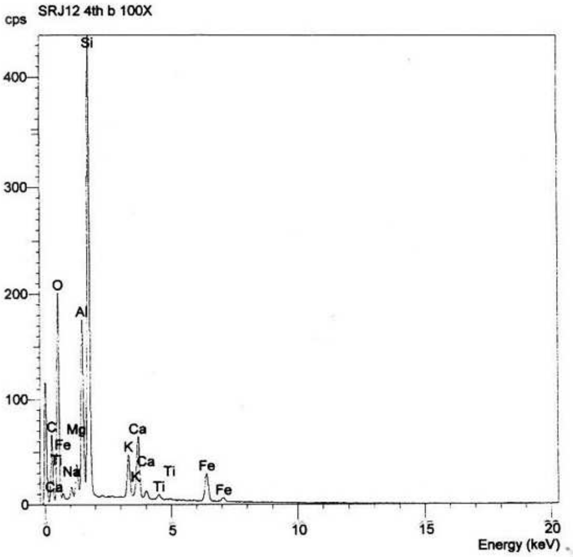

Fig. 5 - Seeraj: identification peaks defined by SEM-EDS (JEOL JSM-35 CF with a standard peak of resolution of 138 eV) analysis of SRJ 12, pipe (G3; fourth bulk analysis at 100X).

collected in an environment characterised by a large river system (low-energy alluvium), with the addition of cereal temper, although some residual, humic, fine matter might be part of the alluvium (MACPHAIL, pers. comm. 2002).

2.2.2. SEM-EDS analysis

Six samples (SRJ 1, G1; SRJ 29, G1 *sub. a*; SRJ 28, G2; SRJ 12, G3; SRJ 26, G4; SRJ 22, G5) were analysed with the SEM-EDS method (Scanning Electron Microscopy - Energy Dispersive Spectrometry)[6]. Four bulk analyses were made on each sample at a magnification of 100X.

Groups 1 and 1 *sub. a* (Table 2; Fig. 4, top left) show homogeneous results, although G1 *sub. a* has a higher percentage of calcium oxide (most probably due to post-depositional factors). G2 (Fig. 4, top right) shows slightly different results, with a lower quantity of aluminia, potash and iron oxide, and higher silica. Group 3 (Fig. 5; Plate 6, bottom) has results similar to those of G1 and G1 *sub. a* with a lower percentage of soda. Group 4 (bangle: SRJ 26; Fig. 4, bottom left) is very different from the other groups; it contains a much lower percentage of magnesium oxide, aluminia, silica, potash, titania, and iron oxide. In contrast, the quantity of calcium oxide is much higher than in the other groups (CaO 26.908%). Group 5 (bangle: SRJ 22; Fig. 4, bottom right) shows a higher percentage of aluminia, silica, manganese oxide, titania with a lower quantity of iron, calcium oxides, and soda than the other samples.

In conclusion, the SEM-EDS results for groups 1, 2 and 3 are rather homogeneous, although not identical, whereas the elemental composition of groups 4 and 5 is quite different from that of the other groups.

2.2.3. Discussion

The geology of the Rohri Hills "*consists of nummulitic limestone having a low dip to the westward, and beneath the limestone forming the eastern scarp of the hills, on the edge of the alluvial plain, a considerable thickness of pale-green gypseous clays is exposed, with a few bands of impure dark limestone and calcareous shale*" (BLANFORD, 1880: 45-46). The green clays are characterised by "*large quantities of gypsum in bands and veins, and with occasional layers of a deep red clay*" (BLANFORD, 1880: 104).

On the basis of these data, and without analysing any clay sample collected in proximity of the site, it is very difficult to suggest either a local or an allochtonous provenance for the ceramic assemblage analysed. Limestone and microfossils are present in groups 2, 4 and 6, but unfortunately it was impossible to identify them at species level. The analysis of the temper indicates a metamorphic background; in particular the tourmaline mineral fragments would suggest granites, although their source might be located many kilometres from the tourmaline-bearing rocks (FREESTONE, pers. comm. 2002). The temper was most probably collected from a river system.

The SEM-EDS results indicate some similarities in the fabrics of groups 1, 2 and 3. This is rather peculiar because, from a microscopic point of view, G1 and G3 are both fine, although different, whereas G2 shows abundant temper, which is absent in the previous groups. In contrast, groups 4 and 5 are rather different from the rest of the assemblage. From a typological point of view they belong to two different bangles, one typical, red painted, specimen

[6] SEM is used in combination with LINK ISIS - Oxford instruments. The machine that was employed is a JEOL JSM-35 CF with a standard peak of resolution of 138 eV, and Window ATW2. Stoichiometry combined elements: Oxygen and Valency: -2. The results are normalised semi-quantitative because of the porosity of the potsherds.

and one coarse, unpainted, oval-sectioned one.

Another interesting observation comes from the analyses of the matrices of groups 1, 2 and 2 *sub. a* and the matrix of the stupa plaster (SRJ 100a). It might be possible to trace a correlation between these pieces, because they all show *"a similar fine fabric slightly clumpy"* (MACPHAIL, pers. comm. 2002).

2.2.3.1. Technological choices and correlations between typology and fabric

A very well developed technology was employed in the production of the Buddhist vessels analysed from Seeraj. The clay must have been levigated and washed (i.e. clay pellets are absent) in different ways (a process of decantation longer than that of groups 2, 4, 5, and 6 characterises groups 1, 1*a*, and 3). Although only two samples were analysed, it might be suggested that specific, micritic clays were chosen for the bangle production. Some sherds were red slipped and polished (e.g. SRJ 1 and 12). The kiln firing temperature was rather high because the sherds show vitrified fabrics; the vitrification region indicates a firing temperature above 850° C (RICE, 1987: 431). The high firing temperature, the control of the atmosphere during the firing (mainly oxidizing), and the surface treatment of the vessels, suggest the employment of a kiln and of specialised artisans.

It is very difficult to define a correlation between typology and fabric since no typological study has ever been conducted on any Buddhist pottery assemblage of Sindh (VERARDI, 1987: 55). Nevertheless, in some cases it is possible to see a clear correlation between typology and fabric. For instance, there is an unquestionable correspondence between the red painted bangle (G4) and its very micritic matrix with an abundant and rather fine temper; sample SRJ 22 (G5) belongs to a fragment of very coarse bangle, which is characterised by a coarse fabric obtained by mixing different clays and abundant temper. Another correspondence can be observed between G1, a very fine red-slipped, polished vessel, and its extremely fine, iron-rich, slightly micaceous matrix without any addition of temper (the red slip is clearly visible in thin section). Also SRJ 12 (G3) is a refined, red slipped, polished pipe characterised by a very fine, silty, micaceous matrix without temper. SRJ 2, an unpainted, rather coarse open plate with thick walls, has the coarsest fabric of the samples analysed from this site. From a typological point of view, groups 2 and 2 *sub. a* show some parallels. Samples SRJ 10, 11, 13, 15, 25, 14 and 27 are decorated with painted bands, whereas SRJ 20, 21, and 28 are characterised by plastic motifs such as instrumental impressed plastic cordons. In spite of the fragmentary status of the potsherds analysed, some similarities in the pottery shapes of groups 2 and 2*a* can be observed, for instance in the bottom sherd SRJ 14, which might belong to an open deep, necked vessel of the SRJ 11 type, and between SRJ 15 and SRJ 27 both in their shape, painted decoration and thickness of the walls. Nevertheless, the potsherds attributed to group 2 include a great variety of forms, painted, incised and impressed ornamentations as well as surface colour. These data should suggest that the correlations that can be traced between typology and fabric are very poor.

It is interesting to note that the surface treatment of groups 1 and 3 - the red slipped and polished, walled vessels - is similar; they both show a very fine fabric characterised by the absence of temper. The fabrics are very fine, although not identical. Furthermore, G3 (the pipe) shows some re-worked alluvium and less iron than G1; while, from a typological point of view, G1 has walls much thinner than those of the pipe. Groups 5 and 6 are very coarse, with thick and undecorated walls, their fabrics are coarse, slightly micritic and different from those of the painted or incised vessels (G2 and G2 *sub. a*) characterised by non-calcareous clay. The red painted bangle shows the only very calcareous fabric of the assemblage analysed. Furthermore, two different clays - as showed by the minero-petrographic analysis (Table 1) and the SEM-EDS results (Table 2) - were employed in the production of two typologically different bangles.

3. Archaeobotanical analyses (R.N.)

Four different contexts close to the stupa were sampled for archaeobotanical analysis (Fig. 2). They are constituted by charcoal fragments alone (sample 1), plaster fragments alone (sample 2), and by both plaster and charcoal fragments (samples 3 and 4).

The study of this material allows the formulation of some hypotheses on the techniques and the materials employed in the construction of the stupa and, perhaps, of other buildings of public or private use, most probably destroyed during the first half of the Eighth century AD.

3.1. Charcoal

134 fragments of charcoal were identified from the samples collected in 2001. A smaller sample of 25 ml, had already been analysed and later submitted for radiocarbon dating (see above). This latter sample was entirely composed of *Acacia* sp. charcoal.

Group	Sample	Mean/s.d.	Na2O	MgO	Al2O3	SiO2	K2O	CaO	TiO2	MnO	Fe2O3	ZnO
1	SRJ1	mean	0,18	1,753	13,89	53,753	5,385	9,365	1,1	0,097	14,243	n/d
1	SRJ1	s.d.	0,002	0,109	0,449	0,764	0,325	0,300	0,145	0,182	0,756	
1a	SRJ29	mean	0,175	1,935	12,988	53,670	4,425	10,743	1,160	0,118	14,705	n/d
1a	SRJ29	s.d.	0,052	0,215	0,572	1,361	0,225	0,709	0,131	0,136	0,323	
2	SRJ28	mean	0,133	1,913	11,475	57,533	3,428	10,868	1,215	n/d	13,183	n/d
2	SRJ28	s.d.	0,153	0,182	0,456	2,020	0,265	1,325	0,257		1,438	
3	SRJ12	mean	0,028	1,710	13,213	54,858	4,943	9,350	1,203	0,133	14,293	n/d
3	SRJ12	s.d.	0,055	0,113	0,466	0,642	0,365	0,881	0,200	0,154	0,864	
4	SRJ26	mean	0,185	1,548	8,245	49,658	2,590	26,908	0,920	n/d	9,698	n/d
4	SRJ26	s.d.	0,184	0,187	0,967	2,266	0,379	2,163	0,094		1,319	
5	SRJ22	mean	0,060	1,683	14,525	56,295	3,853	9,078	1,885	0,263	12,245	n/d
5	SRJ22	s.d.	0,070	0,236	1,076	4,070	0,908	3,164	0,452	0,013	1,635	

Table 2 - Seeraj: SEM-EDS analysis of some potsherds. Not detected (n/d).

Several fragments have diameters of more than 2 cm, some are smaller. It was impossible to define the wood at species level.

Samples 1 (from a dump deposit close to the south-western corner of the stupa) and 3 (dump deposit at the northern branch of the site) exclusively contain fragments of *Dalbergia sissoo* Roxb. ex DC. In transversal plane they show isolated or twin vessels, surrounded by an abundant and characteristic paratracheal parenchyma. In tangential plane are shown the typical mono- and biseriate rays, arranged in horizontal series (storied rays) (BAREFOOT and HANKINS, 1982). Sample 4, from a dump at the base of the western wall of the stupa, contains some large charcoals along with several fragments of plaster. The charcoal sample is entirely made of *Cedrus* sp. wood, with well recognizable scalloped tori borders of the pits in a radial plane.

3.2. Plaster

Sample 2, collected close to the north-eastern corner of the stupa, is constituted by few tenths of large fragments of plaster, some 8-17 mm thick. It can be supposed that it lined part at least of the outer walls of the stupa. The plaster surface is of grey colour, with spots of whitish film, which might represent the residue of the original pigment. Several fragments show leaves and culm impressions of grasses on both sides.

Sample 4 contains some baked brick fragments of ochre or orange colour. In particular their inner surface, which is usually rough, is partially covered by casts of culms and leaves of grasses. They present also impressions of wheat grains (*Triticum* sp.) (Plate 7).

3.3. Discussion

The present vegetal environment that surrounds the site is conditioned by an arid climate with extreme temperatures preventing the growth of arboreal forms. A recent survey of the local flora (RAZA BHATTI *et al.*, 1998-99) lists only halophytic or xerophytic herbs and shrubs. None of these could be currently used as timber, because of their small dimensions and the poor quality of the wood.

The fact that at least some of the religious and housing structures of the site were constructed with baked bricks, following a millennial technique that goes back to the prehistoric cultures of the Indus Valley, clearly points out that the inhabitants had enough wood to burn, available within a radius of few kilometres. At present, a conspicuous arboreal vegetation occupies the alluvial lowland of the Indus, up to a distance of some 40 km, as the crow flies. It is possible to suppose that a similar environment, determined by the groundwater table much more than by climatic changes, was present during the occupation of the site. However, the data provided by different sources (archaeology, charcoal and wood analysis, palynology and pedology) suggest that no real increase in aridity, due to natural climatic causes, occurred within the last five millennia (SETH, 1978).

Whatever were the reasons for the increase of the aridity of the whole area (for a classical, although controversial discussion on the subject, see RAIKES, 1967; a summary can be read in WHITE, 1961) that may have led to the present semi-desert environmental conditions of the Rohri Hills, it seems to be clear that, despite the raw material shortage, the inhabitants did not give up the timber supply necessary to a large part of the local economy, in first instance the baking of the bricks employed in the construction of the stupa.

It is well known that the woods more often used for baking bricks up to recent times, have been furnished from *Tamarix* sp. and *Acacia arabica* (Lam.)

Willd. At Seeraj, only a small number of *Acacia* sp. charcoals has been identified from the samples in proximity of the stupa (roughly the same area from which sample 2, as described above, was collected). This plant easily grows in flat areas with a shallow groundwater table. Although it is absent today in the region, in the past it was found in the *nullahs* (*wadis*) or along the dry slopes of the hills.

The cedar (*Cedrus* cf *deodara*), which occurs in quantity in some samples, is undoubtedly non-local. It points to distant, mountainous origin and to transport by water. Cedar wood was employed as raw building material in the prehistoric cities of the Indus Valley, but also to make sarcophagi (CHOWDHURY and GHOSH, 1951). It cannot be excluded that, as a wood appreciated enough to be worth carrying for a distance of hundreds of kilometres, it was reserved for religious use. If that was the case, its presence on the site as charcoal, could represent the destructive phase of the stupa or of the structures related to it.

Sissoo is an upland tree, which preferably grows in a belt between 600 and 1000 m of altitude, along river courses; it is often found in forest associations. Its wood was much appreciated in the past, both as raw material for the manufacture of objects of current use, and as timber, perhaps also because of its high density. Although it may have been found along the rivers not far from the site, nevertheless its use as fuel seems to have been unlikely. It is probable that it was used, as in the case of cedar, in the construction of this Buddhist site, and burnt after the site was abandoned. PIGGOTT (1950) already pointed out that the *sissoo* plays an important role in the life of Sindh and of the surrounding areas, despite the nauseating smell of its wood, locally known as *tali*.

To conclude, the remarkable homogeneity of the samples suggests that the formation of the archaeobotanical charred materials from Seeraj should be attributed to the combustion - intentional or accidental, whether contemporary to the last phase of the Buddhist settlement or shortly after it was abandoned - of wood carried to the site probably not to be used as fuel.

4. Conclusion (P.B., R.N. and M.S.)

The town of Seeraj is one of the most important Buddhist sites so far discovered in the Rohri Hills and their related territory. Apart from Aror (BUKHARI, 1991), Shah Shakar Ghani (VERARDI, 1987) (Fig. 6), a cave in the same hills (LAGHARI, 1994) and a number of surface scatters of pottery in the recently investigated Thar Desert region around the modern town of Thari (SHAR, 1995; BIAGI and VEESAR, 1998-99; BUKHARI, 1998-99), nothing is known of the archaeology of the Buddhist period in this part of Upper Sindh.

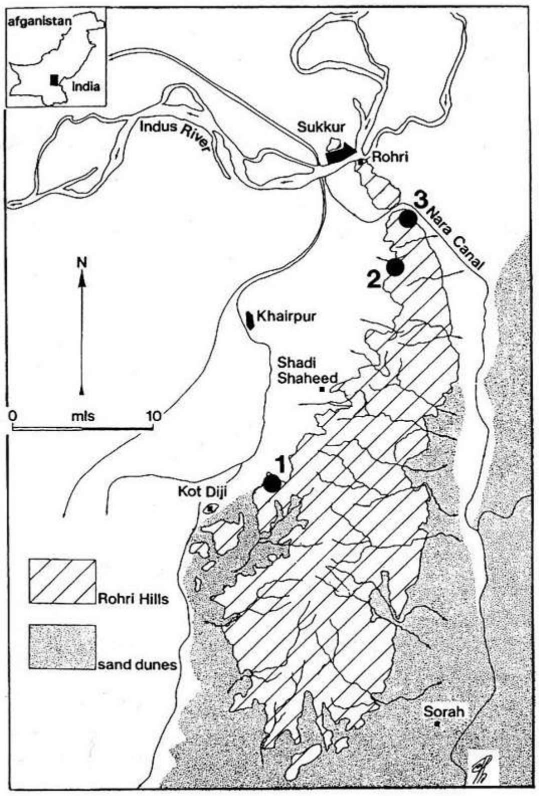

Fig. 6 - Distribution map of the historical sites mentioned in the text, so far known in the north-western part of the Rohri Hills: Seeraj (1), Shah Shakar Ghani (2) and Aror (3) *(drawn by P. Biagi).*

The scientific analyses conducted on a reasonable number of typical potsherds of different pottery shapes, with varying surface aspect, as well as on two bangle fragments, indicate that the vessels decorated with painted and plastic motifs can be clearly distinguished from the red slipped, polished ones; while the raw material employed in the production of the bangles is absolutely different from that of the rest of the ceramic assemblage.

Although very little is known of the characteristics of the Buddhist period pottery of this region, with the exception of the typological list proposed by G.M. SHAR (1995: 149), one can note that the Seeraj ceramic assemblage is very poor in "rosette" decorative motifs. These stamped patterns are considered, by the above-mentioned author, among the more characteristic features of the pottery of his middle historic period, which he attributes to the Eighth-Twelfth century AD. The relative scarcity, although not the complete absence (BUKHARI, 1998-99: 25), of these patterns at Seeraj, might be a further chronological indicator of the abandonment of the site around the beginning of the Eighth century AD, when this variety of pottery began to be in large use in the area, as the finds from Aror and the Thar Desert sites would suggest.

As indicated by the result of the radiocarbon date GrN-26801, at least some of the public structures of the citadel of Seeraj, among which were the stupa, were burnt and consequently abandoned in the above-mentioned period. The fragment of plaster and the thick dumps rich in cedar and *tali* charcoals, which are visible close to the corners of the stupa (Plate 1, n. 3), have revealed that the inhabitants of Seeraj employed allochtonous arboreal species for the construction of their buildings. Given the absence of information on the raw material utilised for construction during the Buddhist period in Upper Sindh, the new data provided by the results of the identification of the Seeraj archaeobotanical samples have shed some light on the commercial role played by the town, especially as regards the import of woody species of great importance for their characteristics as building materials.

In order to achieve a better understanding of the raw material movements in the area during the Buddhist period, it would be very important to multiply the analyses of both archaeometrical and archaeobotanical samples, with the aim of interpreting the importance of various materials utilised in both pottery manufacture and building construction techniques. This would be of key importance for the comprehension of the different areas of raw material supply and of the commercial radius covered by the different sites.

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REFERENCES

BALL, W. 1989 - The Buddhists of Sind. *South Asian Studies*, 5: 119-131. Cambridge.

BAREFOOT, A.C. and HANKINS, F.W. 1982 - *Identification of Modern and Tertiary Woods*. Clarendon Press, Oxford.

BIAGI, P. and CREMASCHI, M. 1988 - The Early Palaeolithic sites of the Rohri Hills (Sind, Pakistan) and their environmental significance. *World Archaeology*, 19 (3): 421-433. London.

BIAGI, P. and VEESAR, G.M. 1998-99 - An Archaeological Survey in the Neighbourhood of Thari in the Thar Desert (Sindh, Pakistan). *Ancient Sindh*, 5: 93-118.

BLANFORD, W.T. 1880 - The Geology of Western Sind. *Memoirs of the Geological Survey of India*, XVII (1): 1-210. Calcutta.

BUKHARI, M.F. 1991 - *The Archaeological Site of Aror*. Institute of Sindhology, Jamshoro.

BUKHARI, M.F. 1998-99 - Buddhist Period in Sindh: Some Decorative Patterns. *Ancient Sindh*, 5: 23-28. Khairpur.

CHOWDHURY, K.A. and GHOSH, S.S. 1951 - Plant remains from Harappa 1946. *Ancient India*, 7: 53-62.

COUSENS, H. 1929 - *The Antiquities of Sind with Historical Outline*. Calcutta.

GYULAI, F. and KÁLLAY, M. 1998-99 - A drink remain from Seeraj (Sindh, Pakistan). *Ancient Sindh*, 5: 29-34. Khairpur.

JAFRI, A. 1980 - *A report on the archaeological site "Seeraj" District Khairpur*. Thesis submitted for M.A. Degree examination. Department of Archaeology, Shah Abdul Latif University, Khairpur (unpublished).

KALICHBEG FREDUNBEG, M. 1990 - *The Chachnama, an ancient History of Sind, Giving the Hindu period down to the Arab Conquest*. Allied Book Company, Karachi.

LAGHARI, M.H. 1994 - Archaeological Cave Sites in the Rohri Hills. *Ancient Sindh*, 1: 117-129

LAMBRICK, H.T. 1973 - Sindh before the Muslim conquest. *History of Sindh Series*, Vol. 2. Sindhi Adabi Board, Jamshoro.

VAN LOHUIZEN, J.E. 1981 - The Pre-Muslim Antiquities of Sindh. In KHUHRO, H. (ed.) *Sind Through the Centuries*: 42-57. Oxford University Press, Karachi.

MAJUMDAR, N.C. 1934 - Explorations in Sind. Being a report of the exploratory survey carried out during the years 1927-28, 1929-30 and 1930-31. *Memoirs of the Archaeological Survey of India*, 48.

MCCRINDLE, J.W. 2000 - *Ancient India as described by Ptolemy*. Mushiram Manoharlal, New Delhi (reprint).

MUNSELL SOIL COLOR CHARTS 2000 - Munsell Color, GretagMacbeth, New Windsor, NY.

PANHWAR, M.H. 1983 - *Chronological dictionary of Sind*. Institute of Sindhology, University of Sind, Jamshoro.

PIGGOTT, S. 1950 - *Prehistoric India*. Penguin Books, London.

RAIKES, R., 1967 - *Water, Weather and Prehistory*. John Baker, Oxford.

RAVERTY, H.G. 1979 - *The Mihran of Sind and its tributaries*. Sang-e-Meel Publications, Lahore (reprint).

RAZA BHATTI G., QURESHI, R. and MEMON, R.A. 1998-99 - Present flora of the Rohri Hills. *Ancient Sindh*, 5: 7-22.

RICE, P.M. 1987 - *Pottery Analysis. A sourcebook*. University of Chicago Press, Chicago.

SETH, S.K. 1978 - The Desiccation of the Thar Desert and its Environs during the Protohistorical and Historical Periods. In BRICE, W.C. (ed.) *The Environmental History of the Near and Middle East Since the Last Ice Age*: 279-305. Academic Press, London.

SHAR, G.M. 1995 - *Prehistoric and Historic sites in the west of the Rohri Hills and the Thar Desert*. Thesis submitted for PhD Degree examination. Free University Berlin (unpublished).

SORLEY, H.T. 1968 - *The Gazetteer of West Pakistan. The former Province of Sind (including Khairpur State*. West Pakistan Government Press, Karachi.

STUIVER, M., REIMER, P.J. and BRAZIUNAS, T.F. 1998 - High-precision radiocarbon age calibration for terrestrial and marine samples 1998. *Radiocarbon*, 40 (3): 1127-1151.

VERARDI, G. 1986 - Religions, Rituals and the Heaviness of Indian History. *Annali dell'Istituto Orientale di Napoli*, 56: 215-253.

VERARDI, G. 1987 - Thoughts on the Buddhist sites of Sind. *Journal of Sindhological Studies*. Summer 1987: 40-75. Jamshoro.

WHITE, R.O. 1961 - *Evolution of Land Use in South-Western Asia*. In STAMP, L.D. (ed.) *A History of Land Use in Arid Regions*: 57-118. UNESCO, Paris.

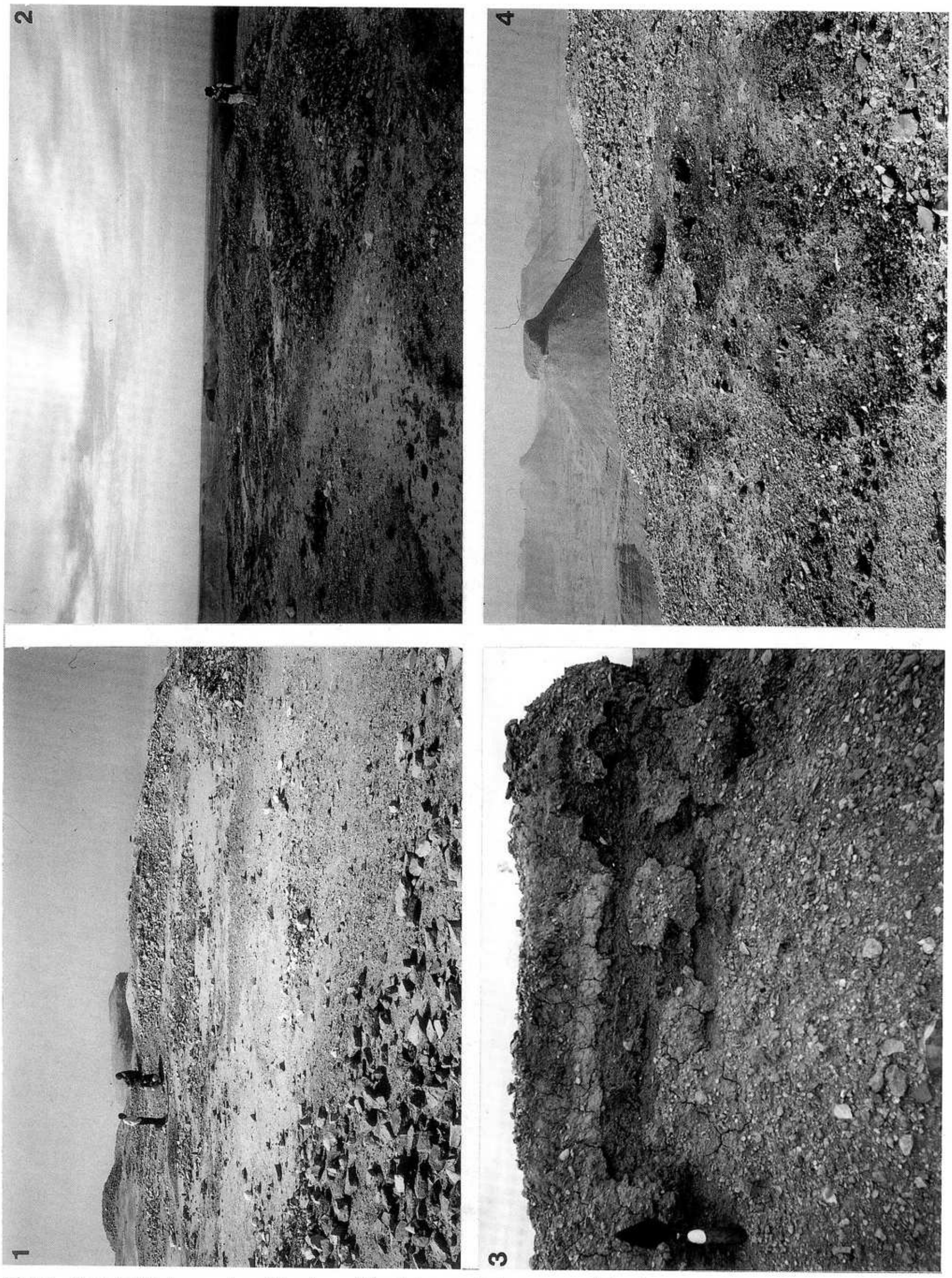


Plate 1 - Seeraj, Hill A: remains of the stupa (1), of stonewalled structures (2), of a mud-brick wall (3) and of charcoal heap 1 (4) (*photographs by P. Biagi*).

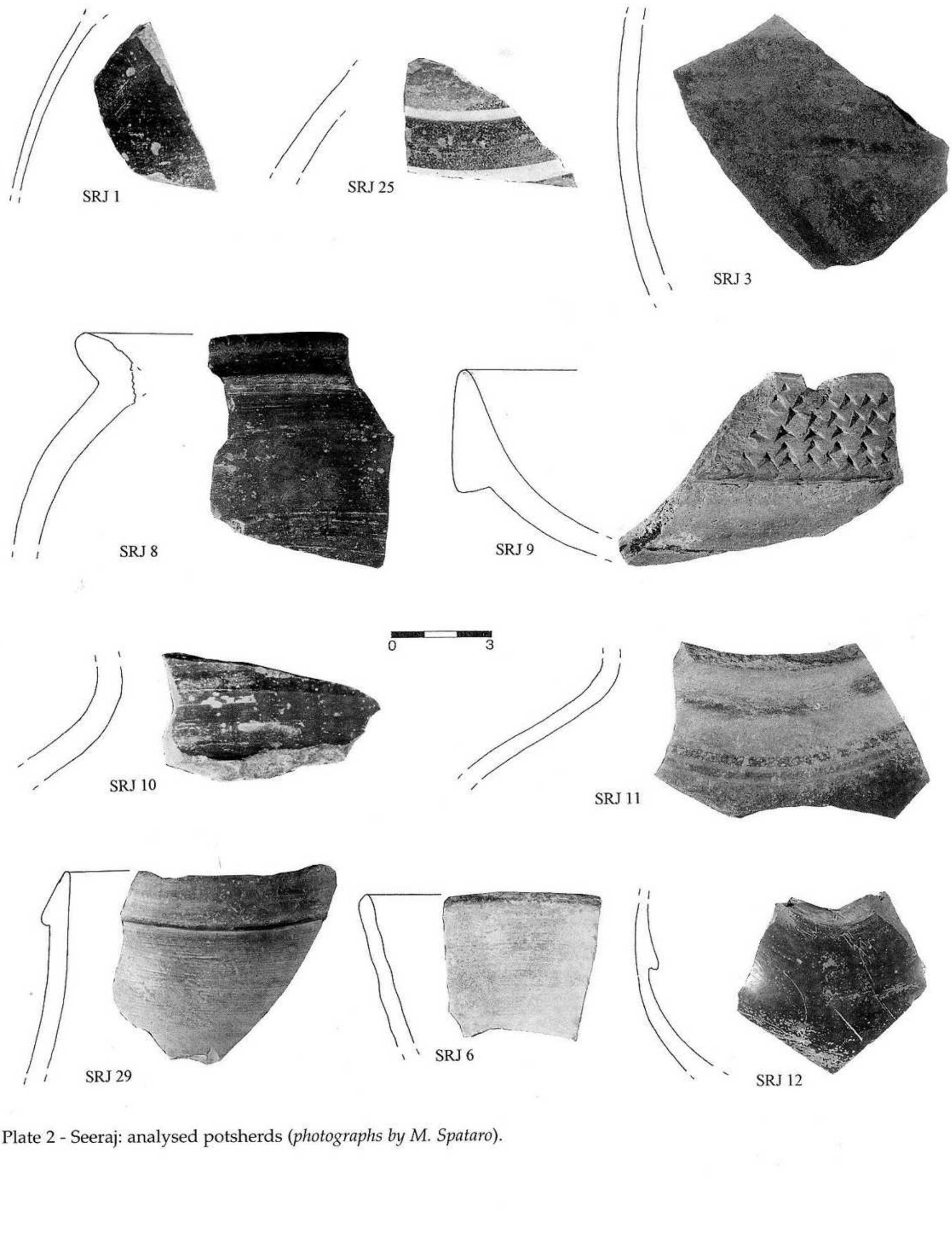


Plate 2 - Seeraj: analysed potsherds (*photographs by M. Spataro*).

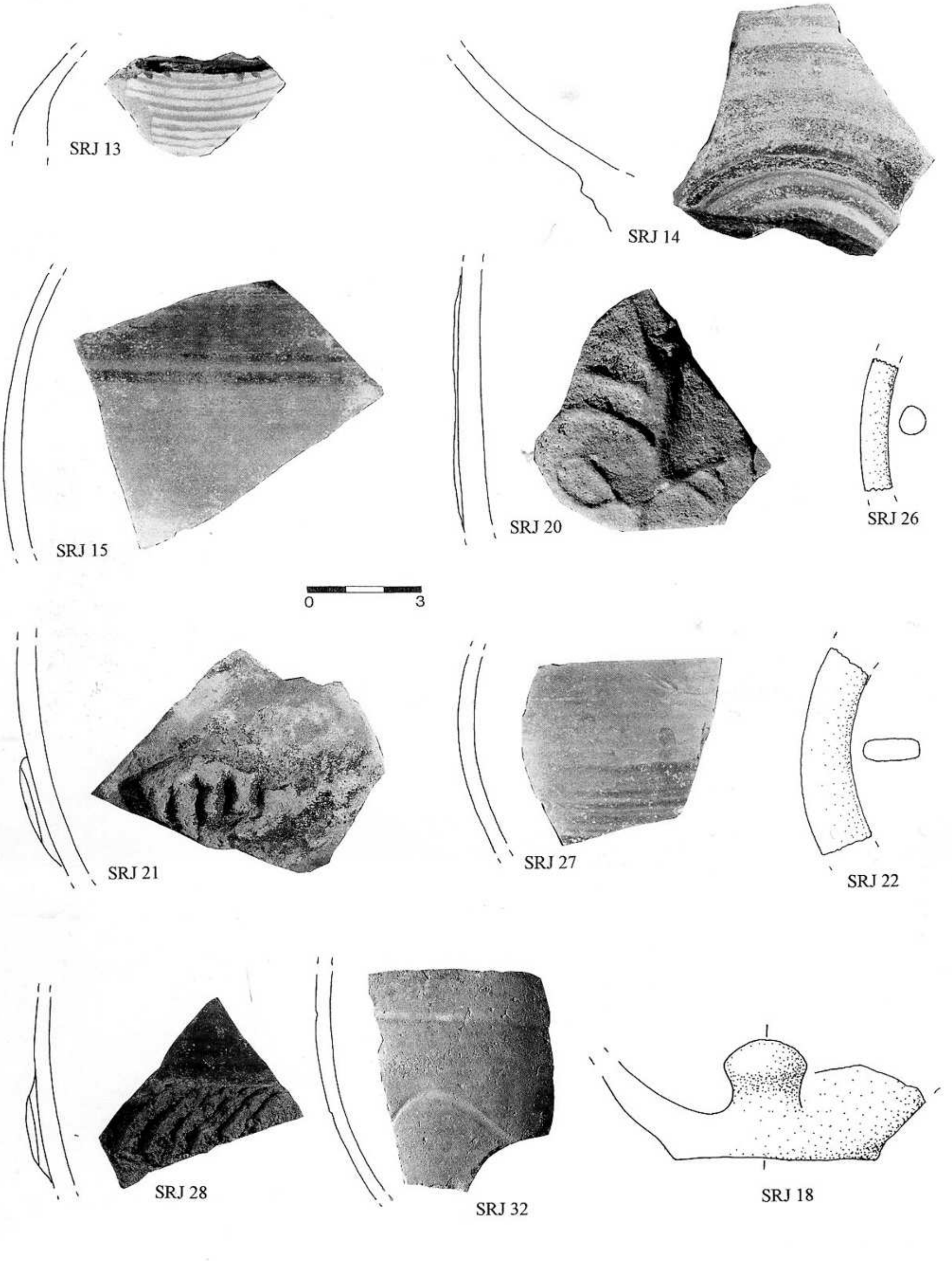


Plate 3 - Seeraj: analysed potsherds (*photographs by M. Spataro*).

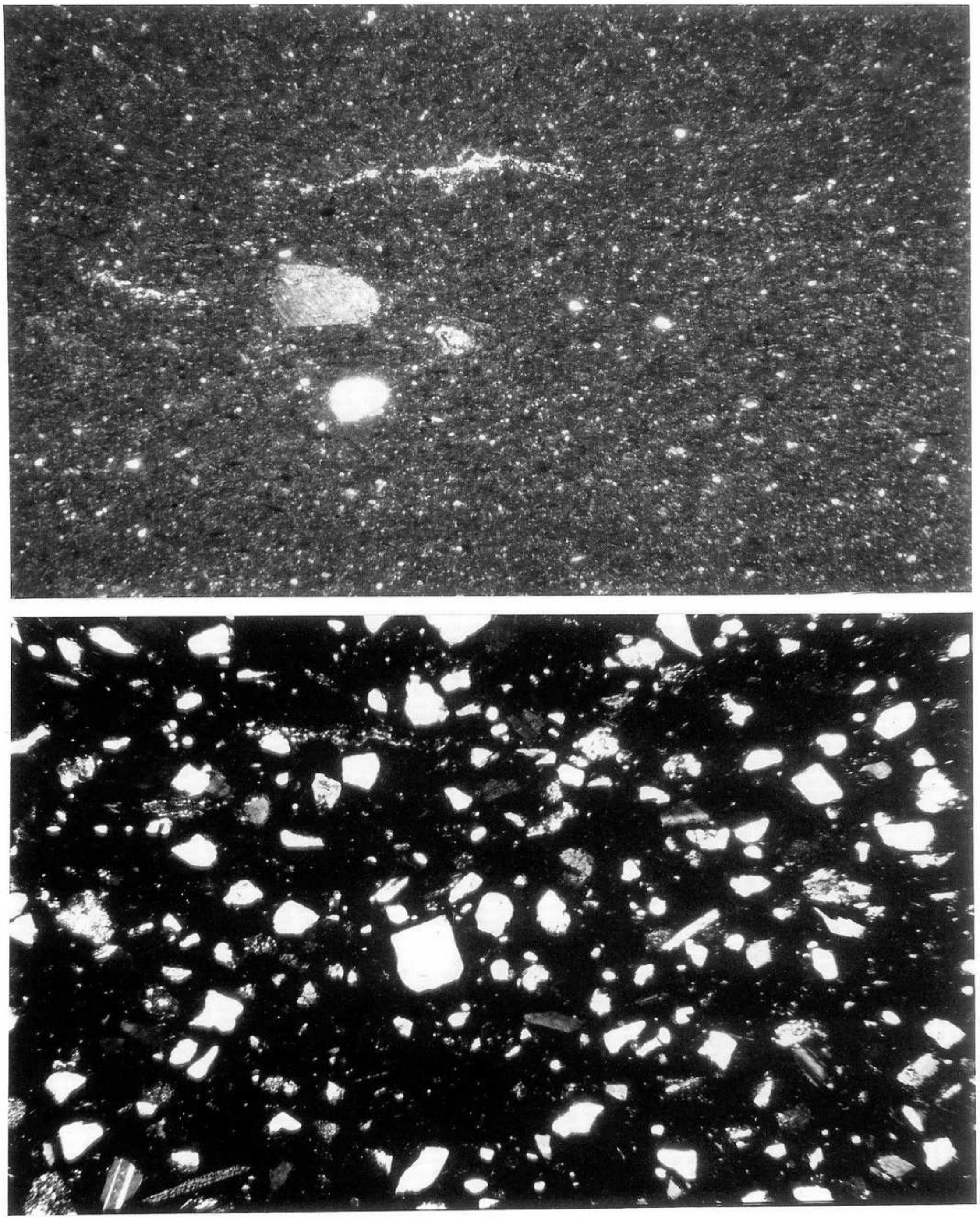
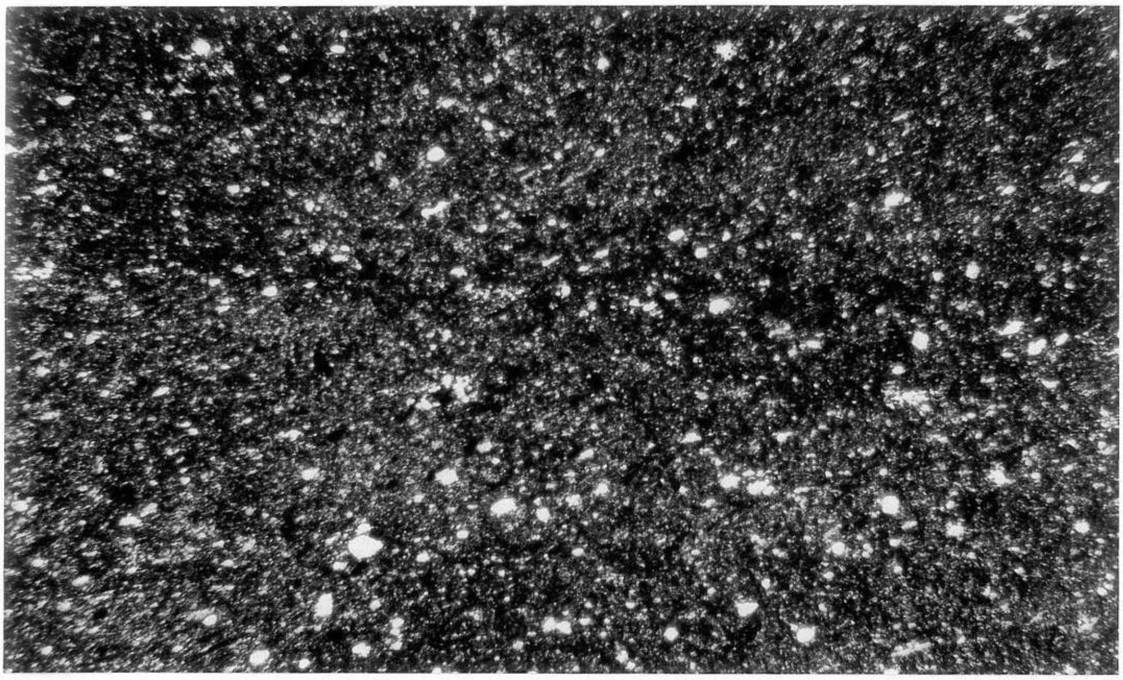


Plate 4 - Seeraj: photomicrographs of thin section samples: SRJ 1, showing a very reddish, fine and vitrified matrix with rare quartz inclusions (top); SRJ 3 showing a dark brown-reddish and micaceous matrix with abundant inclusions of quartz, feldspar, biotite and muscovite micas, pyroxene and feldspar (bottom) (N+ 40X) (*photographs by M. Spataro*).



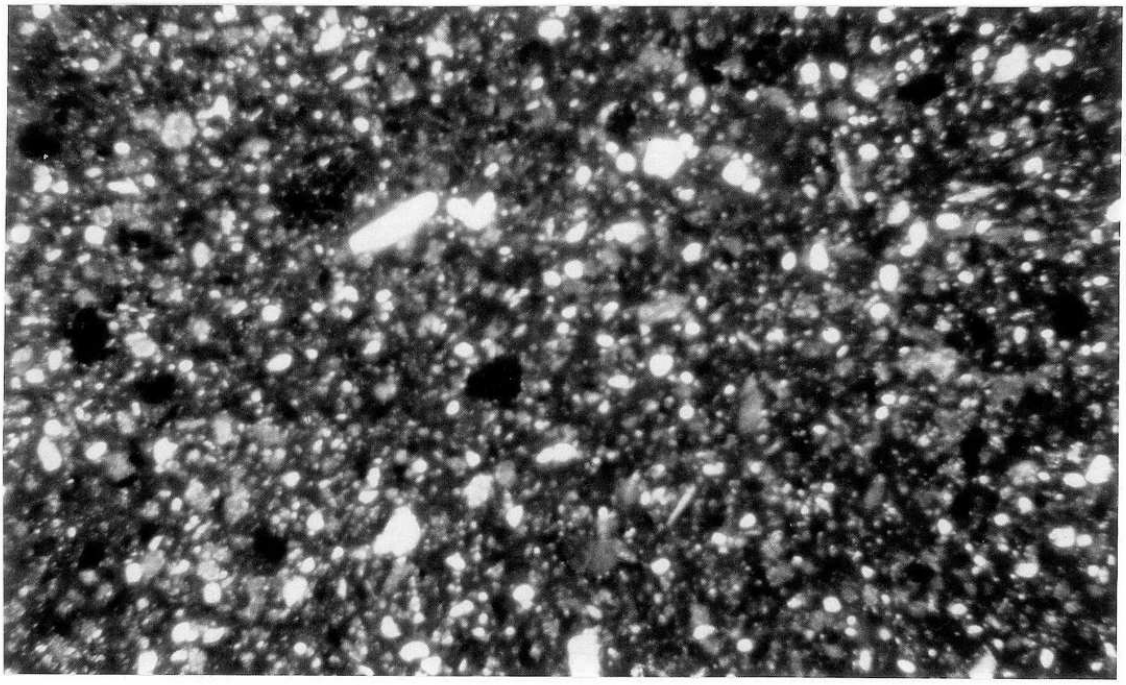


Plate 5 - Seeraj: photomicrographs of thin section samples: SRJ 12 (pipe) showing a very fine fabric with some quartz and re-worked alluvium (top); SRJ 26 (bangle) showing a brown micritic matrix with abundant fine inclusions such as quartz, white and brown micas, pyroxene and opaques (bottom) (N+ 40X) (*photographs by M. Spataro*).

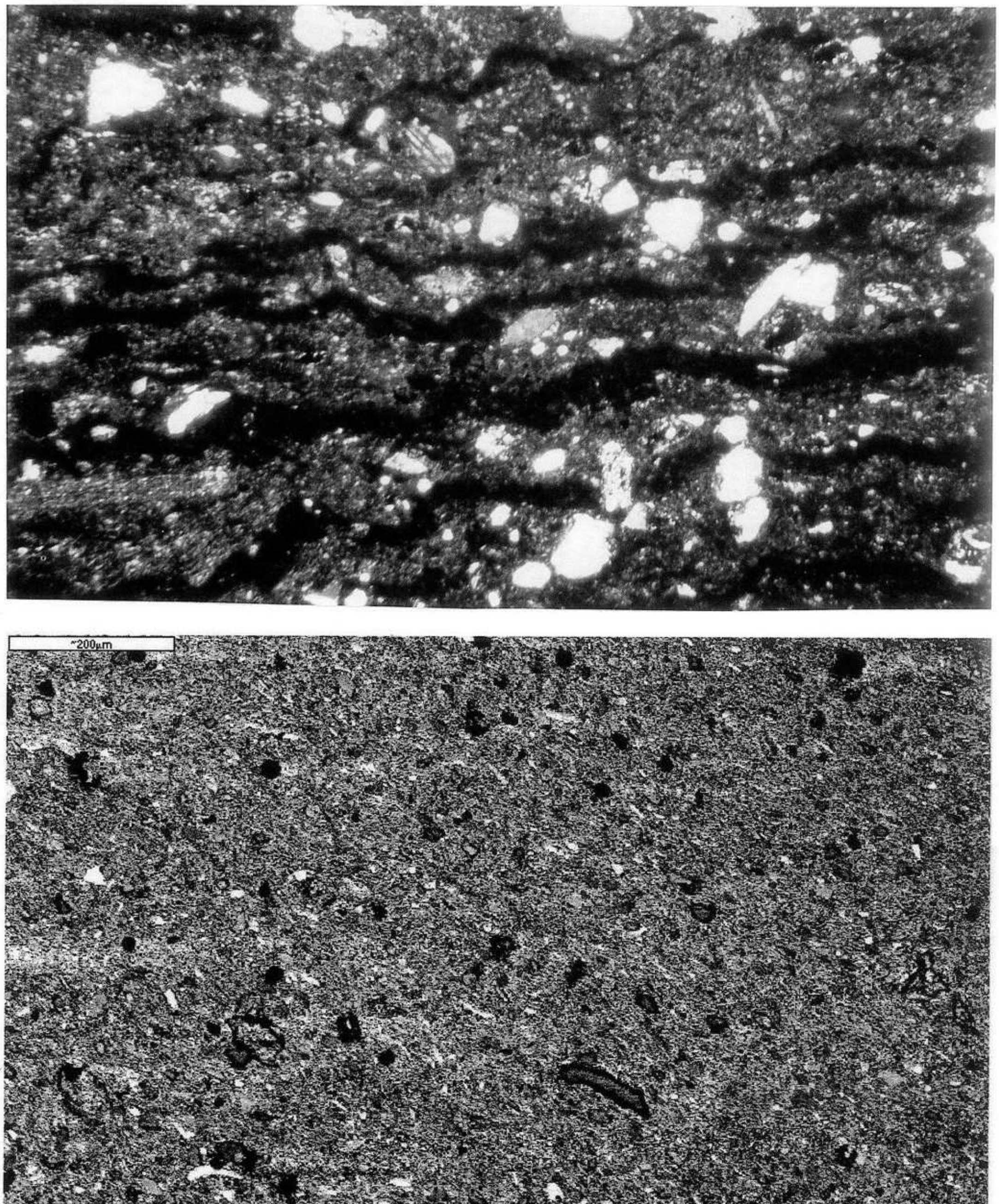


Plate 6 - Seeraj: SRJ 22 (bangle) showing artificially mixed clays, red non-calcareous clay with brown micritic clay, quartz, muscovite mica and pyroxene (top) (N+ 40X); SEM image in BSE (Back Scattered Electron) of sample SRJ 12 showing a fine matrix with quartz and heavy minerals (white spots) (bottom) (100X) (*photographs by M. Spataro*).

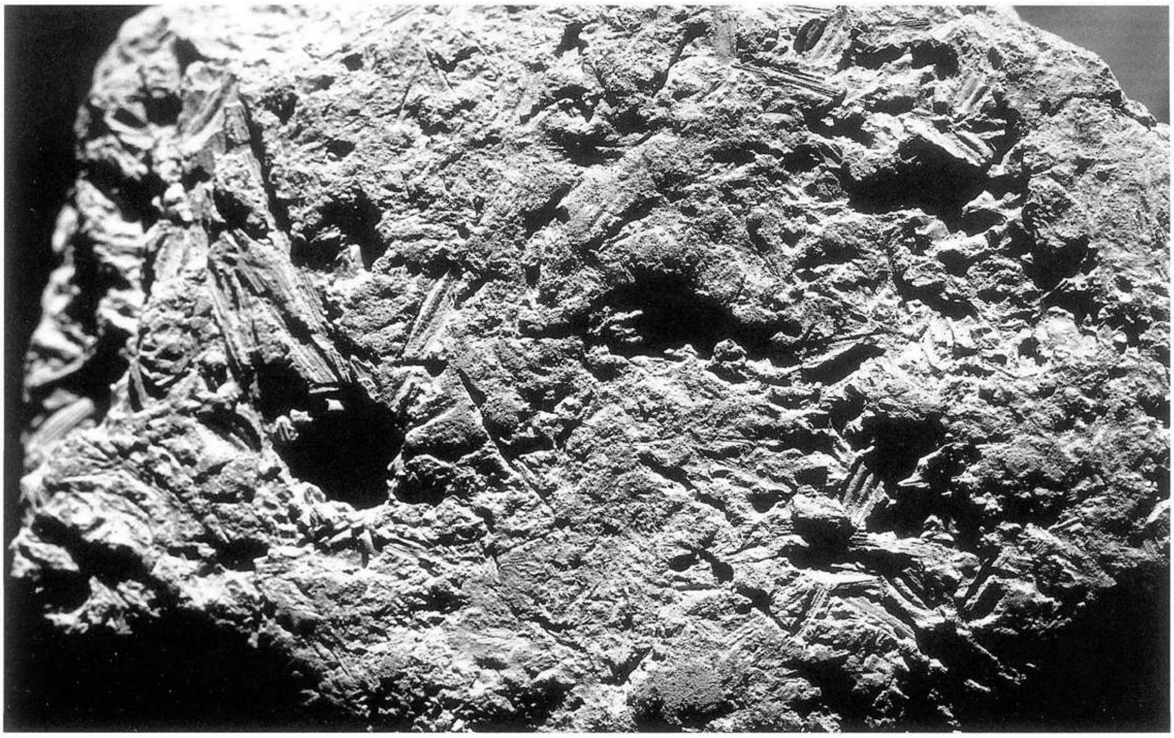


Plate 7 - Seeraj: fragment of plaster from the western wall of the stupa with leave and culm impressions of grasses (*photograph by R. Nisbet*).