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Textiles from Zawaydah, Naqada, Upper Egypt

Abstract

The article presents the results of textile and fibre analysis of four textile fragments recovered during archaeological excavations at the site of Zawaydah, Naqada, in Upper Egypt. Although the main phase of the occupation at this site is ascribed to the Pre- and Protodynastic period (c. fourth millennium BC), the structural and fibre analyses of the textiles and the subsequent radiocarbon dating of two fragments provide evidence of later phases of site use, to be assigned to the Middle Kingdom, possibly the New Kingdom, and the Middle Ages (second millennium BC and second millennium AD). The article offers an insight into the Egyptian textiles of these latter time periods at the site, and highlights the importance of detailed structural and fibre analysis for acquiring dating information and informing the decisions to carry out further analyses, such as radiocarbon dating.

Keywords: Egypt, Zawaydah, Naqada, archaeological textiles, radiocarbon dating

Introduction

Five textile fragments were found during excavations conducted at the site of Zawaydah, Naqada, in Upper Egypt (fig. 1a), by the Italian Archaeological Mission of the then Istituto Universitario Orientale (IUO), today the University of Naples L'Orientale, Naples (Italy). These investigations took place from 1977 to 1986 under the direction of C. Barocas, R. Fattovich and M. Tosi (Fattovich et al. 2007). Zawaydah refers to a settlement site lying on a gravel terrace at the edge of the low desert, whose northern portion corresponds to the settlement known as South Town, investigated by W. M. Flinders Petrie from 1894 to 1895 (fig. 1b; Petrie & Quibell 1896, 50, 54, pl. IA, LXXXV). Naqada, the wider multi-component site where Zawaydah is located, is best known for its extensive cemeteries dated to the Predynastic period (circa fourth millennium BC), discovered and excavated by Petrie at the end of the 19th century (Petrie & Quibell 1896).

In the preparation of the finds and materials from the Italian investigations at Naqada for its final publication (Di Pietro, forthcoming), four of the five textile fragments retrieved during this fieldwork underwent in-depth analyses, the results of which are presented in

this paper. Due to the problematic nature of the contexts from which these textiles were collected at Zawaydah, one of the main objectives of these analyses was dating them and defining their relationship with other material culture from the site. The latter, which also includes a conspicuous number of textile tools (Gleba & Di Pietro forthcoming) is to be associated primarily with the Pre/Protodynastic settlement at the site (Di Pietro 2017). The detailed structural and fibre analyses recently performed proved useful in providing crucial new dating information and informed the decision to carry out further analyses. An insight into the textiles of the Middle Kingdom, possibly New Kingdom, and Medieval Egypt, representing previously unknown aspects of the material culture of Zawaydah, can now also be offered as a contribution to ancient textile studies.

Material and context

The textiles examined in this paper were recovered from different squares and levels within two main trenches investigated at Zawaydah by the IUO Mission: ZWW (or Zawaydah west), excavated in 1979, and ZWE (or Zawaydah east), excavated between 1979

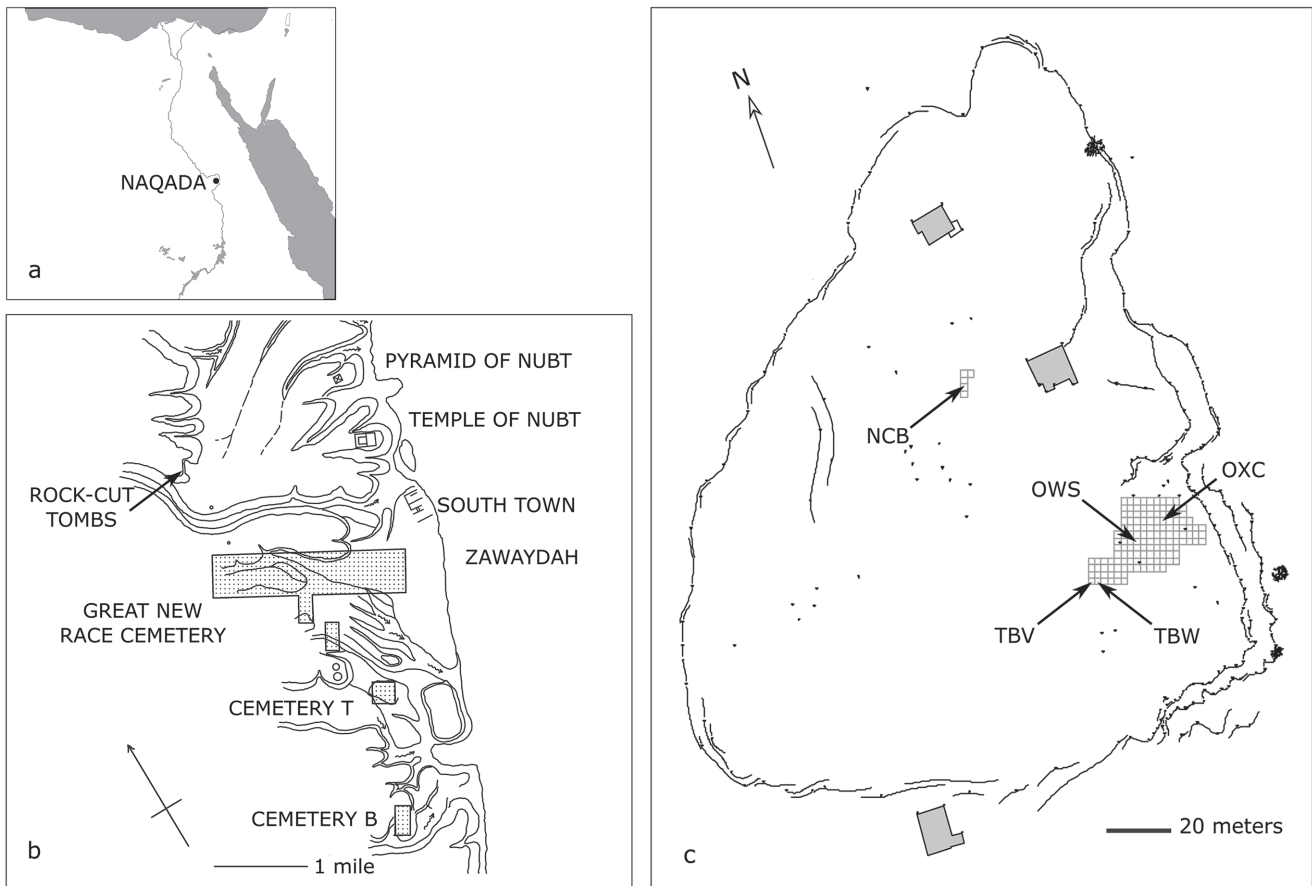


Fig. 1: a) Map of Egypt; b) Sketch map of the site of Naqada with an indication of the main sites explored by Petrie. The burial areas are stippled (after Petrie and Quibell 1896, pl. IA); c) plan of the site of Zawaydah with an indication of the squares where the textile fragments were collected (Image: Grazia Di Pietro)

and 1986 (fig. 1c). As far as the collection methods are concerned, based on the available archival records, it is unclear whether the textile fragments were hand picked over the course of the excavation or were collected from sieved deposits.

Four of the five textiles were exported to Italy, together with samples of other archaeological materials, in order to undergo analyses that could not be conducted in Egypt. This followed practices that were common and legal at the time of the fieldwork (in contrast to later constraints upon the transfer of archaeological samples out of Egypt) and are reflected in the documents on file in the archives of the IUO Mission. In recent years, these fragments, previously kept at the Bioarchaeological Research Centre of the International Association of Mediterranean and Oriental Studies (IsMEO) in Rome, have been made available for study, in anticipation of the final comprehensive publication of the finds from the Italian investigations at Naqada (Di Pietro, forthcoming). The fifth textile fragment, currently kept at the Storehouse of the

Supreme Council of Egyptian Antiquities in Qift, was photographed during the 2008 and 2009 study season conducted by one of the authors in Egypt but could not be re-examined for the purpose of the present study.

Details regarding the context of recovery of all the textile fragments from Zawaydah and associated cultural material are presented in table 1, while a brief overview of the site's state of preservation and chronological framework is presented below. At the time of the Italian fieldwork, the site of Zawaydah had suffered ubiquitous disturbance. Although during the excavation different stratigraphic layers were distinguished, the deposits were too heavily disturbed to allow a clear subdivision of these vertical units in chronological terms.

Due to the dearth of samples deemed suitable for radiocarbon dating, pottery has been the key tool used for defining the chronology for the different cultural phenomena recorded at the site. In particular, the ceramic evidence indicates that the occupation in the area of the western trench (ZWW) covered a relatively



Field Inventory No	Context ID	Find Context
598 * * Textile fragment currently stored in Egypt.	TBV	Eastern trench (ZWE), Square 2x2m TBV; <u>Context type</u> : mixed deposit; <u>Cultural material</u> : textile fragment; pottery; lithics; fragments of miniature vessels; fragments of miniature boats; wooden fragment; bone and shell fragments.
676	OXC-hole 1	Eastern trench (ZWE), Square 2x2m OXC, posthole 1; <u>Context type</u> : backfill of voided hole (possibly post-hole, c. 22 cm deep); <u>Cultural material</u> : textile fragment; charcoal.
741	TBW-1	Eastern trench (ZWE), Square 2x2m TBW, Level 1; <u>Context type</u> : mixed deposit; <u>Context description</u> : the layer's matrix included abundant lumps of reddish and grey clay; <u>Cultural material</u> : textile fragment; a few pottery sherds; disk-shaped clay sealing with seal impression (possibly Naqada III); clay bead.
852	OWS-1	Eastern trench (ZWE), Square 2x2n OWS, Level 1; <u>Context type</u> : mixed deposit; <u>Context description</u> : layer with disturbed incoherent deposit; <u>Cultural material</u> : textile fragment; a few pottery sherds; clay bead; shell.
853	NCB-2	Western trench (ZWW), Square 2x2m NCB, Level 2; <u>Context type</u> : mixed deposit; <u>Context description</u> : textile fragment; layer of 'red soil' with sparse mudbrick and clay remains; <u>Cultural material</u> : textile fragment; pottery; lithics; a clay sealing with seal impression; beads; refined clay lumps; faunal and botanical remains.

Table 1: List and contexts of recovery of textile fragments at Zawaydah

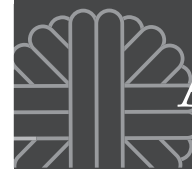
broad stage of the Predynastic period: approximately Naqada I-II (circa 3700 BC to 3400 BC). A negligent component (ranging from 0.55 % to 2.96 %) of the ceramic assemblage may be connected to later (post-prehistoric) activity in this part of the site. This is confirmed by at least one clay sealing with an impression featuring a hieroglyphic inscription, found in the square IWV (level 1-2). In the area of the eastern trench (ZWE), the majority of the pottery can be assigned to the Late Predynastic-Protodynastic period (circa Naqada IIC-IIID to Naqada IIIA; circa 3500 BC to 3150 BC; Di Pietro 2016). Here, too, a minor component of the ceramic assemblage (ranging between 10 % and 30 %) relates to a later occupational phase, or at least the site's use, dated provisionally to the New Kingdom (circa second half of the second millennium BC).

Based on currently available evidence, the major ancient phase of occupation at Zawaydah is to be ascribed to the Pre/Protodynastic period, with a minor phase possibly occurring in the New Kingdom. Human presence and activity at the site certainly predate the fourth millennium BC, as demonstrated by a few Palaeolithic stone implements retrieved here (Giuseppina Mutri, pers. comm. 2018), and presumably never ceased between the fourth and the second millennium BC as well as afterwards. Indeed, the temple of Nubt located nearby, to the north of the terrace of Zawaydah (fig. 1b), was in use almost continuously at least from the middle of the third

to the early first millennium BC (Petrie & Quibell 1896, 34, 60, 65–70). Post-Pharaonic remains in the wider site of Naqada are also reported by Petrie (for example, some New Kingdom rock-cut tombs being re-used by Coptic hermits, fig. 1b; Petrie and Quibell 1896, 34, 69, pl. I-IA), and highlighted by the recent archive- and field-based research (Stevenson & van Wetering, forthcoming). Ongoing studies of the rest of the archaeological materials collected at Zawaydah by the Italian expedition, as well as forthcoming publications arising from investigations carried out at the site by other teams (for example, Stevenson & van Weterin, forthcoming) are expected to elucidate further chronology and character of human activity at the site, especially during the historical phases, which are poorly known so far. In the meantime, the results from the analyses that were performed on the textile fragments and are reported below add invaluable new information to the reconstruction of the complex history of this site, along with their contribution to ancient Egyptian textile studies.

Textile analysis

The structural examination of four textile fragments was carried out at the McDonald Institute for Archaeological Research, University of Cambridge. Digital microphotographs were taken using a portable Dino-Lite digital microscope at different magnifications (x 20, x 50, x 230 magnifications). The data on the fifth fragment 598 was extrapolated from



a photograph (fig. 4). The summary of the structural textile analysis is presented in table 2.

One object (676) is a short cord fragment, while the remaining three fragments are woven in tabby (fig. 2). None of the fragments preserve any other structural features. The absence of edges precludes definitive identification of warp and weft direction.

The four objects analysed have different yarn structures (fig. 3). The cord 676 is Z-ply of two s-twisted yarns. Fragment 741 is woven in spliced and S2-ply yarn, with clearly visible splices. The slightly denser system in this fragment is most likely the warp, as is common with spliced Egyptian textiles, which tend to be warp-dominant, i.e. with more warp than weft threads per cm. Textile 852 is woven in single s-twisted yarn. Finally, textile 853 is woven in single

z- or clockwise-twisted yarn. The threads appear to be unevenly dyed in a dark (originally black?) colour.

Although it was not possible to examine the fifth textile found at Zawaydah, the photograph taken during the preliminary examination in Egypt shows that this fragment, too, is a tabby, with circa 6 to 8 threads per cm in both systems and s-twisted yarn (fig. 4).

Fibre identification

Fibre identification and analysis of the textiles from Zawaydah were carried out at the McDonald Institute for Archaeological Research, University of Cambridge using Hitachi TM3000 TableTop Scanning Electron Microscope (SEM) in order to determine the morphological characteristics of the fibre and to acquire more detailed surface information for fibre

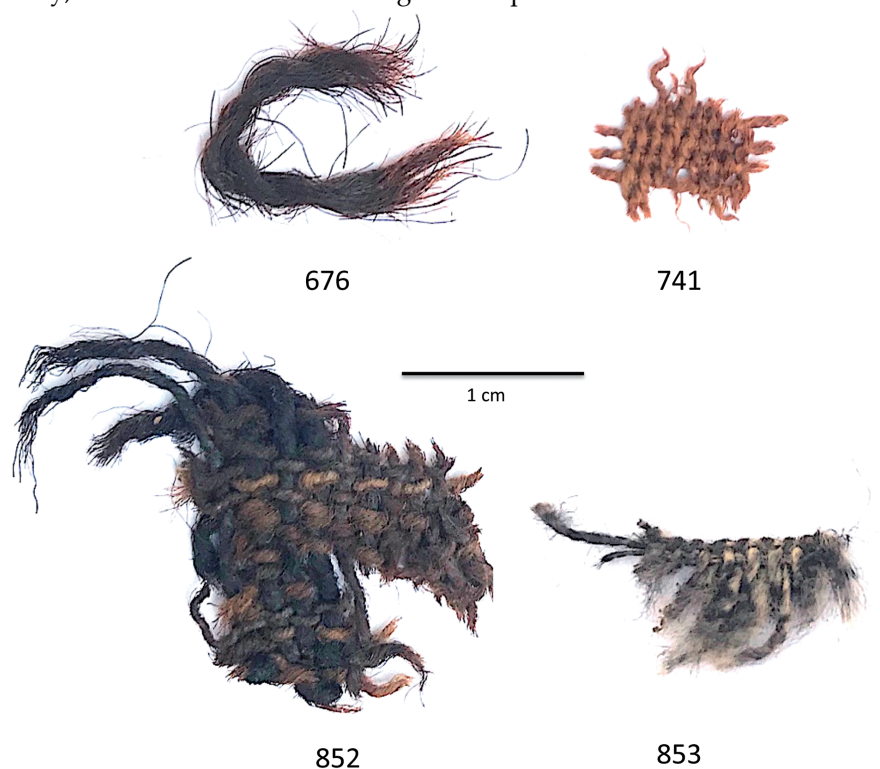


Fig. 2: Micrographs of textile fragments from Zawaydah (Images: Margarita Gleba)

Object	Weave	System 1 count	System 2 count	System 1 twist	System 2 twist	System 1 diameter	System 2 diameter	System 1 angle	System 2 angle
598	tabby	6-8	4-6	s	s	c. 1	c. 1	medium-hard	medium-hard
676	cord	NA	NA	S2z	NA	2.1-2.5	NA	low	-
741	tabby	15	10	S2*z	S2*z	0.5-0.9	0.4-0.6	NA	NA
852	tabby	15	10	s	s	0.5-0.8	0.5-0.9	medium-hard	medium-hard
853	tabby	14	?	z	z	0.5	0.6-0.8	medium	low

Table 2: Technical textile data summary (thread counts are in threads per cm; diameters measured in mm; NA=not applicable)



identification. The following instrumental settings were used: analytical condition mode at 15.00 kV accelerating voltage, compositional imaging and working distance of 5 mm to 10 mm. The fibres were examined longitudinally and, where possible, in cross section for morphological features. The diameter of fibres was measured using the SEM utility tool. The

measurements were carried out at x 400 magnification. The samples were not coated. The results are summarised in table 3.

Fibres were well preserved, allowing identification of the raw material in all four cases. Fragment 741 is made of flax (*Linum* sp.), as indicated by the characteristic dislocations or nodes, the fibre diameters (table 2) and

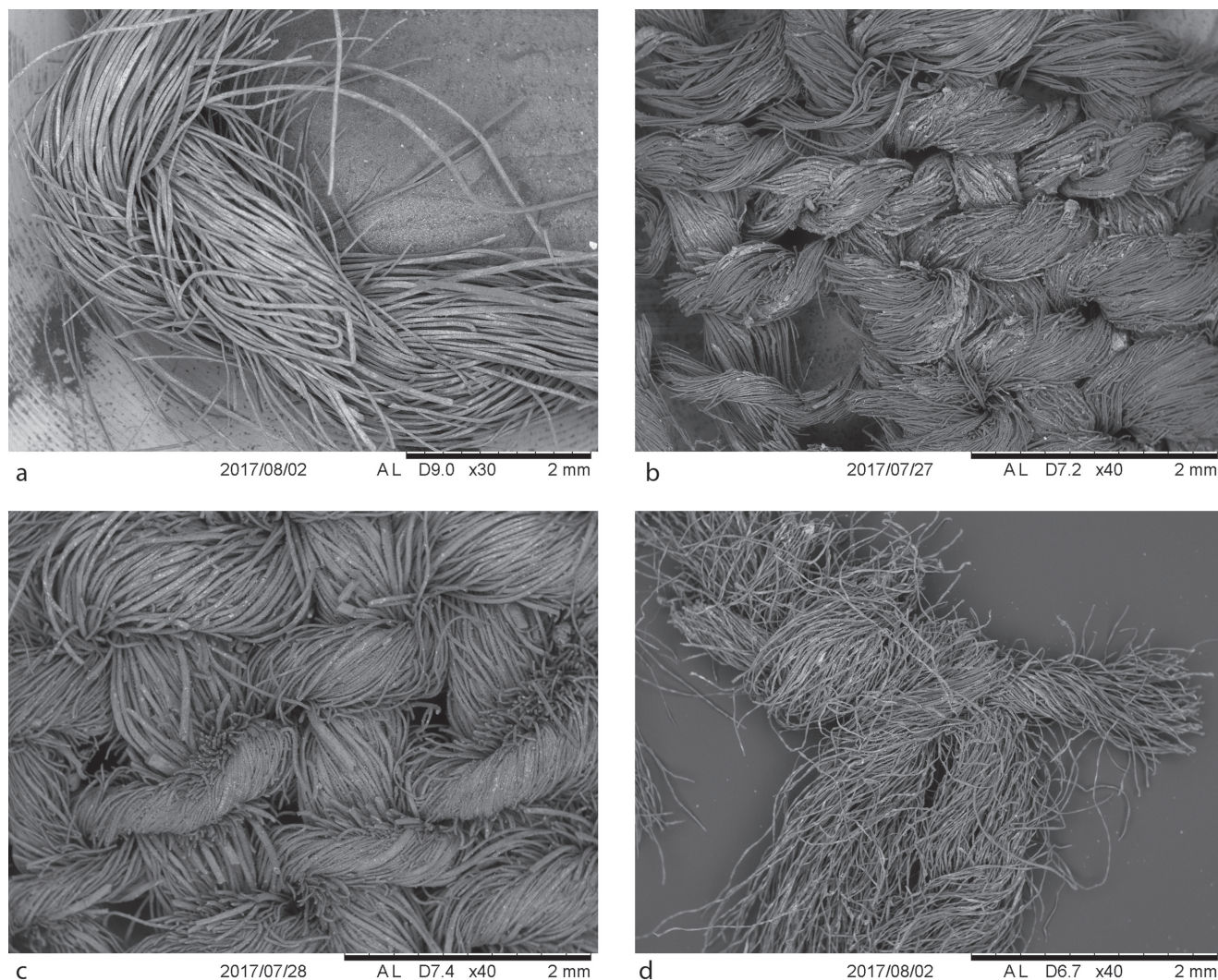


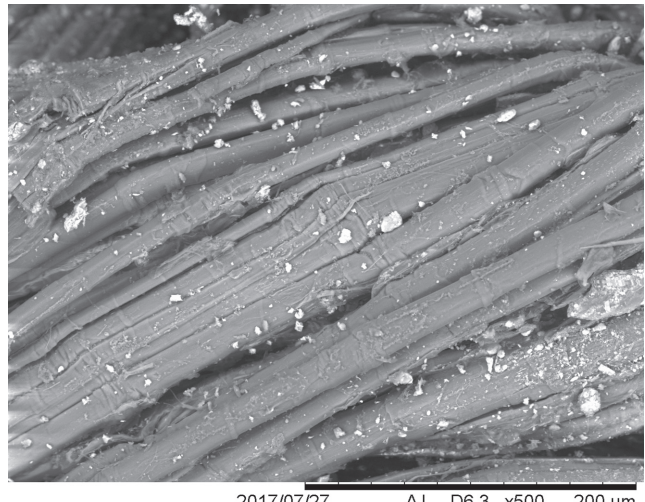
Fig. 3: SEMicrographs of textile fragments from Zawaydah: a) 676; b) 741; c) 852; d) 853 (Images: Margarita Gleba)

Object	Textile weave	No fibres	Mean	Range	Characteristics	Material
676	cord	67	42.4	19-69, 76, 84	irregular mosaic cuticle pattern	sheep wool
741	tabby	17	13.1	7.1-21.6	dislocations, bundles, splices	flax
852	tabby	136	27.3	11-113 with interruptions	irregular mosaic cuticle pattern	sheep wool
853	unidentifiable	15	19	15-21	ribbon-like flat structure	cotton

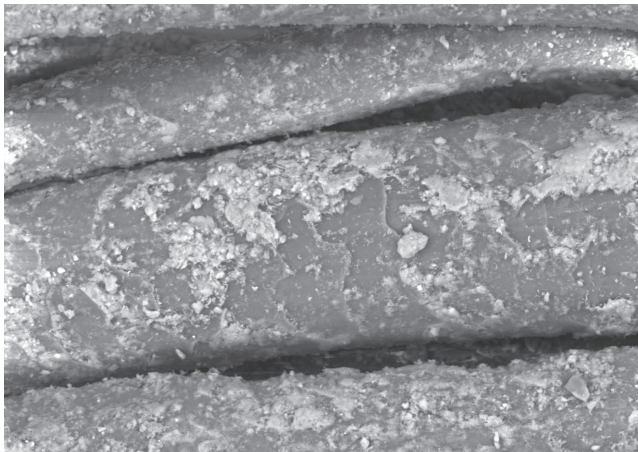
Table 3: Fibre identification data summary (mean and range are in microns)



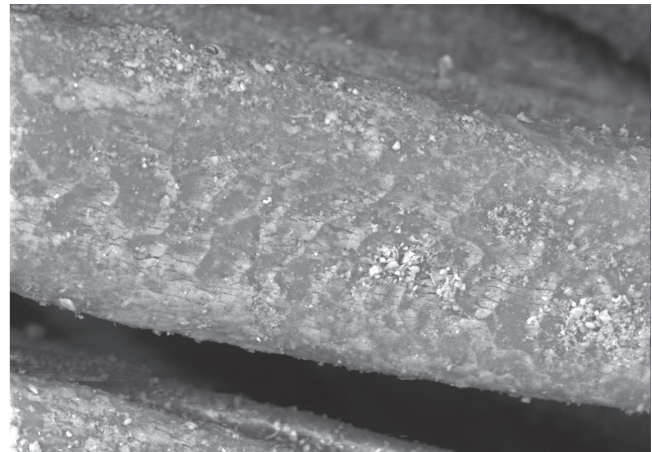
Fig. 4: Image of the fragment 598 (Image: Grazia Di Pietro)



2017/07/27 AL D6.3 x500 200 um
Fig. 5: SEMicrograph of fibres in Zawaydah textile fragment 741 (Image: Margarita Gleba)

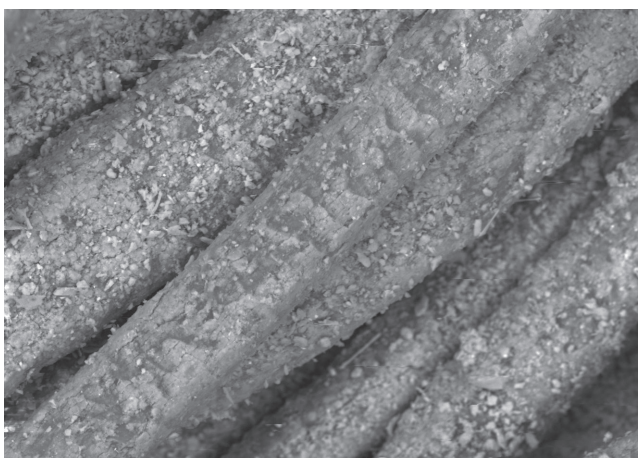


a 2017/08/02 AL D8.2 x1.0k 100 um

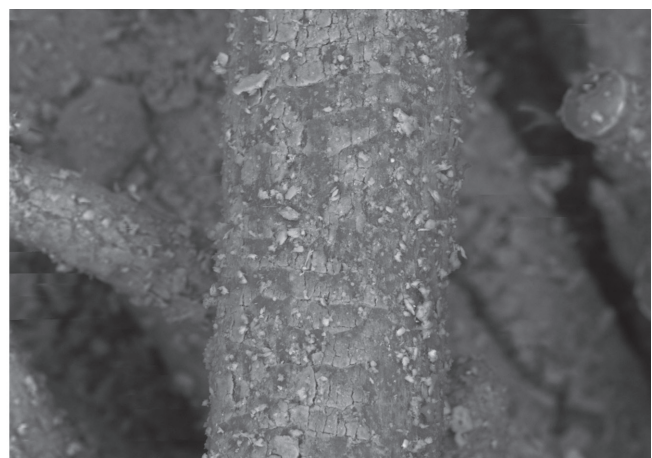


b 2017/08/02 AL D7.9 x1.0k 100 um

Fig. 6: SEMicrographs of fibres in Zawaydah textile fragment 676 (Images: Margarita Gleba)



a 2017/07/28 AL D7.5 x1.0k 100 um



b 2017/07/28 AL D7.8 x1.0k 100 um

Fig. 7: SEMicrographs of fibres in Zawaydah textile fragment 852 (Images: Margarita Gleba)

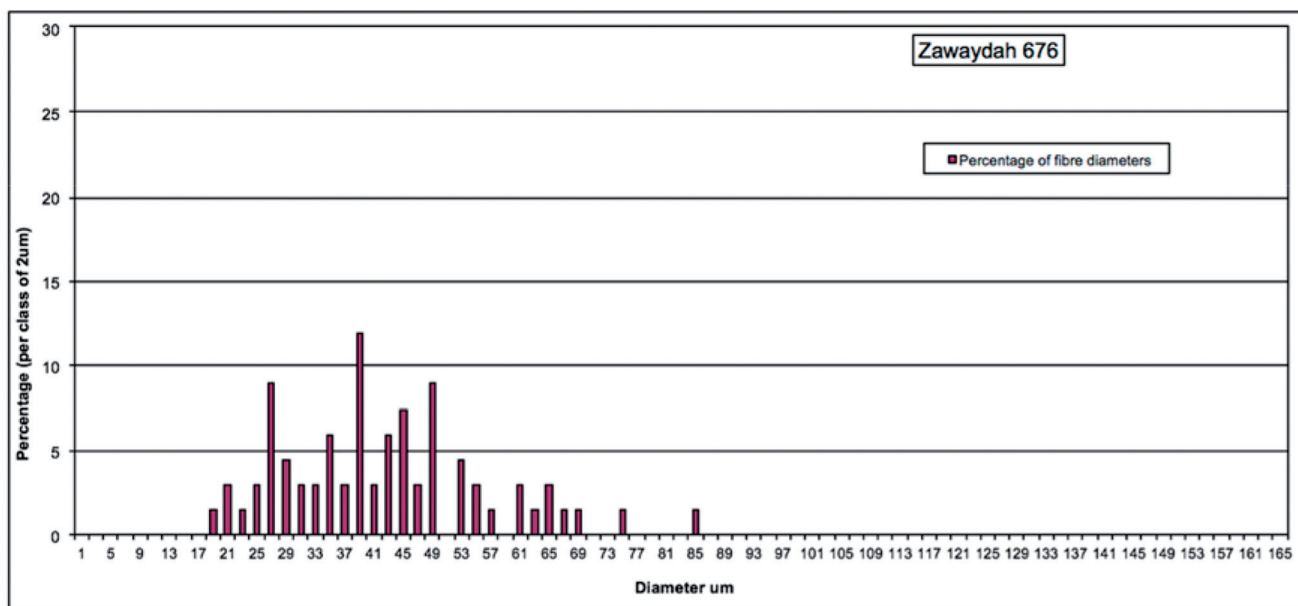


Fig. 8: Fibre diameter distribution histogram of Zawaydah 676 (Image: Margarita Gleba)

occasional S-cracks in the fibres, which suggest the S fibrillar orientation of the fibre (fig. 5) (Bergfjord & Holst 2010, 1193; Haugan & Holst 2013; Suomela et al. 2018). Fibres are still in bundles, which is typical for spliced threads (Gleba & Harris 2018).

Cuticular scales were present in fragments 676 and 852, indicating animal fibre (fig. 6 and fig. 7). Both are likely to be sheep’s wool, as indicated by the irregular mosaic cuticle pattern, but differ substantially in

quality, with the former having a narrower diameter range of 19 microns to 65 microns, a few coarser fibres and higher mean diameter of 42.4 microns, in comparison to the wider range of 11 microns to 113 microns (with many interruptions) and lower mean diameter of 27.3 microns in the latter (fig. 8 and fig. 9). Based on Ryder’s system, fragment 676 can be classified as Hairy Medium, while fragment 852 is closer to Generalised Medium (Ryder 1964).

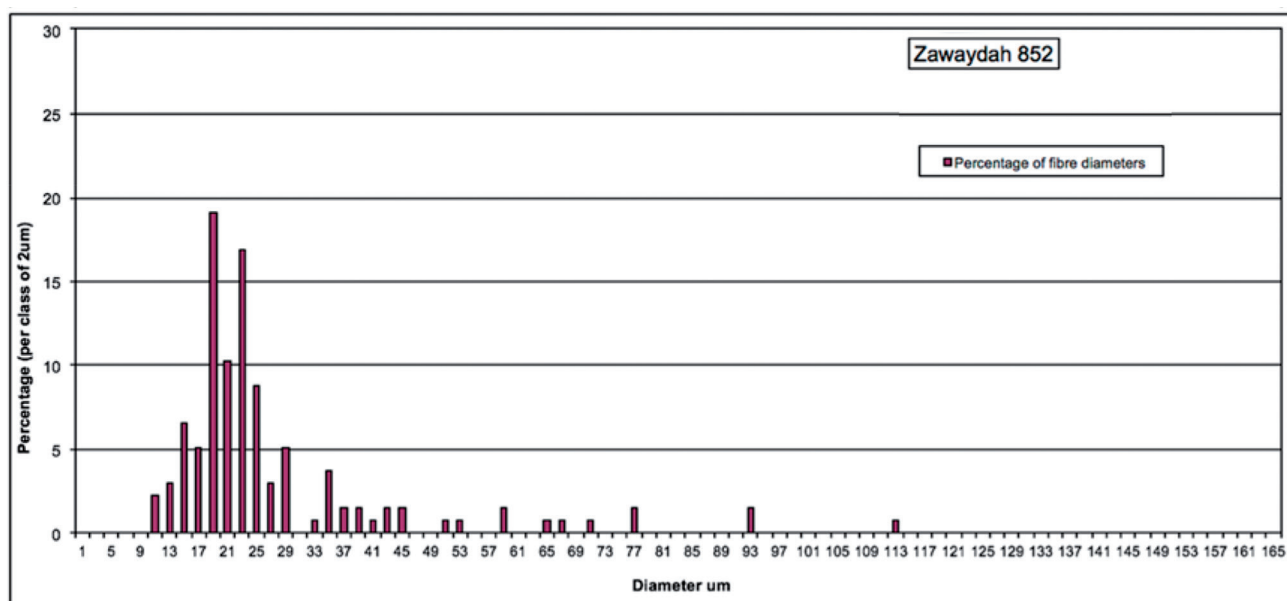


Fig. 9: Fibre diameter distribution histogram of Zawaydah 852 (Image: Margarita Gleba)



Fig. 10: Micrographs of fibres in Zawaydah: a) 676; b-c) 852, showing pigmentation (Images: Margarita Gleba)

In both cases, the wool is pigmented, ranging from brown to almost black, with larger fibres medulated (fig. 10). In 852, one of the systems is woven in darker, almost black, fibres, while the fibres in the other system range from beige (originally white?) to brown. Fragment 598, currently stored in Egypt, may also be made of animal fibre based on its macroscopic appearance and variable brown colour, but nothing more can be said about it based on the inspection of a photograph (fig. 4). Fragment 853 is made of cotton, which has long ribbon-like fibres twisting in the Z direction (fig. 11).

Dating

Fibre and structural analysis of the textile fragments from Zawaydah provided some initial indications regarding their dating. Linen textile 741, from ZWE, was the most likely of the group to date to the Predynastic period. However, given that the splicing technique continued in Egypt until about 600 BC (Granger-Taylor 1998), precise dating was not possible on the basis of structural analysis alone.

The wool fragments, also recovered in the eastern trench (ZWE), could have been Pharaonic in date but unlikely to be Predynastic, given that their wool quality was comparable to that of the textiles from the Workmen's Village at Amarna, dated to the New Kingdom (Kemp & Vogelsang-Eastwood 2001, 40-51). Nevertheless, the dating of these fragments requires further verification either by means of radiocarbon dating or by a close comparison with material coeval with most of the other finds from Zawaydah (i.e. Predynastic wool textiles). An ideal candidate for such a comparative assessment would have been a "piece of brown and white woollen knitted stuff" that Petrie reports from tomb T26 of the nearby Predynastic Cemetery T at Naqada (cf. fig. 1b; Petrie & Quibell 1896, 24) but its current whereabouts are unknown. The cotton fragment was clearly a late intrusion in

the context of its retrieval (ZWW, the western trench; cf. above), as cotton in Egypt was only introduced in the Roman era (Wild et al. 2008). Its z-twist is unusual for Egypt, where s-twist has been dominant since prehistoric times. At the same time, although z-twist is not common in Egypt until the Medieval era, z-twisted cotton textiles were imported to Egypt from India in Roman times (Kemp & Vogelsang-Eastwood 2001, 24-5; but see Wild et al. 2008, 146, for other potential sources).

As funding was available to carry out two radiocarbon dating analyses, the decision was made to date the potentially oldest (linen) and youngest (cotton) fragments. The results arising from radiocarbon dating (AMS) (fig. 12), performed at the Royal Institute for Cultural Heritage, in Brussels (Belgium), show that the linen fragment 741 can be assigned to the Middle Kingdom (circa 1980-1760 BC; cf. Hornung et al. 2006), while the cotton fragment 853 falls within the Islamic period or Middle Ages (640 AD to 1517 AD; cf.

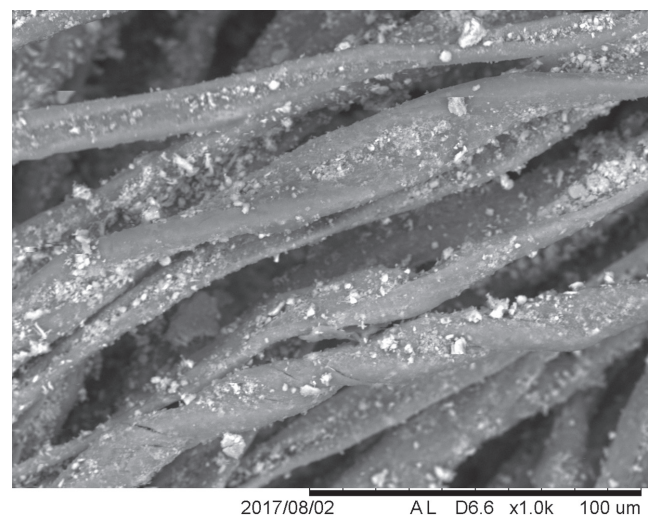


Fig. 11: SEMicrograph of fibres in Zawaydah textile fragment 853 (Image: Margarita Gleba)

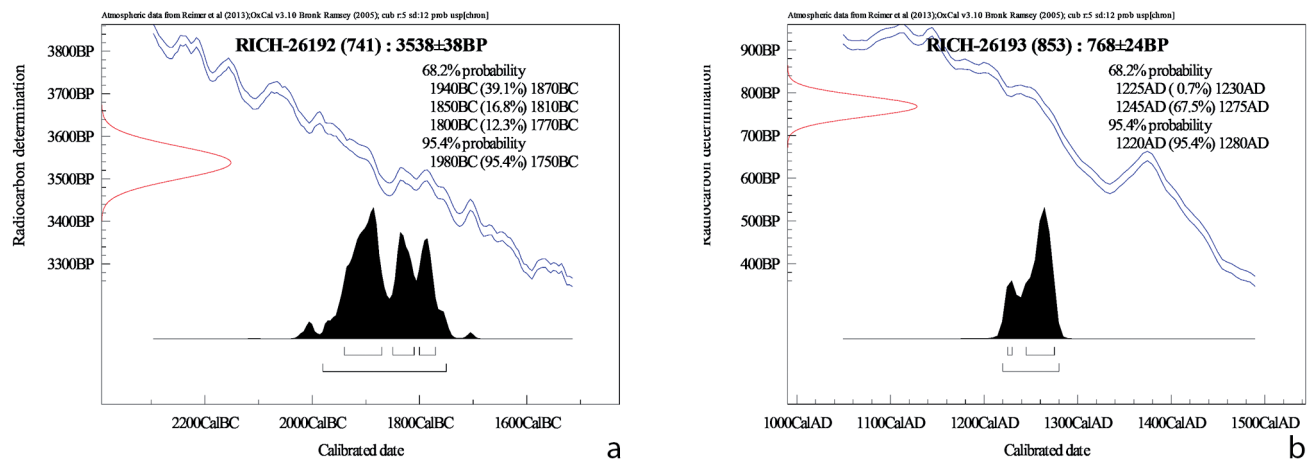


Fig. 12: a) Date of Zawaydah textile 741; b) Date of Zawaydah textile 853 (Images: Mathieu Boudin)

Petry 2008). Neither of the radiocarbon dated textile fragments from Zawaydah dates to the Predynastic times.

Discussion and conclusions

Results from the analyses conducted on four textiles from Zawaydah presented above confirm that the deposits and archaeological materials within the two main trenches excavated at the site by the IUO Expedition represent a “palimpsest” – a site with a variety of features from different periods – as already observed by the excavators and gleaned from post-excavation studies on the ceramics. Yet, the textile evidence suggests that Zawaydah had a more complex site formation and history of human activity than that reconstructed so far (i.e. two main phases ascribed to the Predynastic and the New Kingdom; see above, and Petrie & Quibell 1896, 54), and points to – at the very least – further events in site’s use or frequentation in the early second millennium BC and early second millennium AD. These new data fit well within the history of the wider site of Naqada as it is understood today. However, only further in-depth research at Zawaydah itself and on the other classes of material from the site can clarify whether the textiles examined reflect isolated episodes of human presence or can be related to more substantial activity carried out at the site.

More generally, the present study reinforces the importance of detailed structural and fibre analysis of textile finds from complex archaeological contexts. Such studies can provide crucial dating information based on the technical characteristics and raw material of the finds, which may inform the decisions to carry out further analyses, such as radiocarbon dating. On the other hand, investigation of textiles is important in

and of itself, as it adds to the understanding of textile history in specific geographical areas: this study offers new data that increases our current knowledge of the ancient Egyptian textile industry during the Middle Kingdom, potentially the New Kingdom and, later, Medieval times.

Acknowledgments

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