Preliminary Report on the results to date of the project grant for 'The western Nile Delta as seen within a broader North African perspective'.

Grant holder: Joanne Rowland, University of Edinburgh

Ground tools from Merimde Beni Salama (MBS)
Use-wear and micro-residue analysis undertaken by Giulio Lucarini and Anita Radini

Micro-residue analysis - Study sample

Five lower grinding stones manufactured in quartzitic sandstone were selected for plant micro-residue analysis. These are the only ground tools, among the MBS freshly excavated items (2013-2015), which come from secure stratigraphic contexts.

Special find	Area of provenance	Type	Raw material	Technology
7	WGNW, Area A, Sector 41	Lower grinder	Quartzitic sandstone	Knapped and ground
13	T2-B extension	Lower grinder	Quartzitic sandstone	Ground
14	T2-B extension	Lower grinder	Quartzitic sandstone	Ground
15	T2-B extension	Lower grinder	Quartzitic sandstone	Ground
45	Area E, Wall Trench South, 20 m from E end	Lower grinder	Quartzitic sandstone	Knapped and ground

Methods

Extraction of the debris

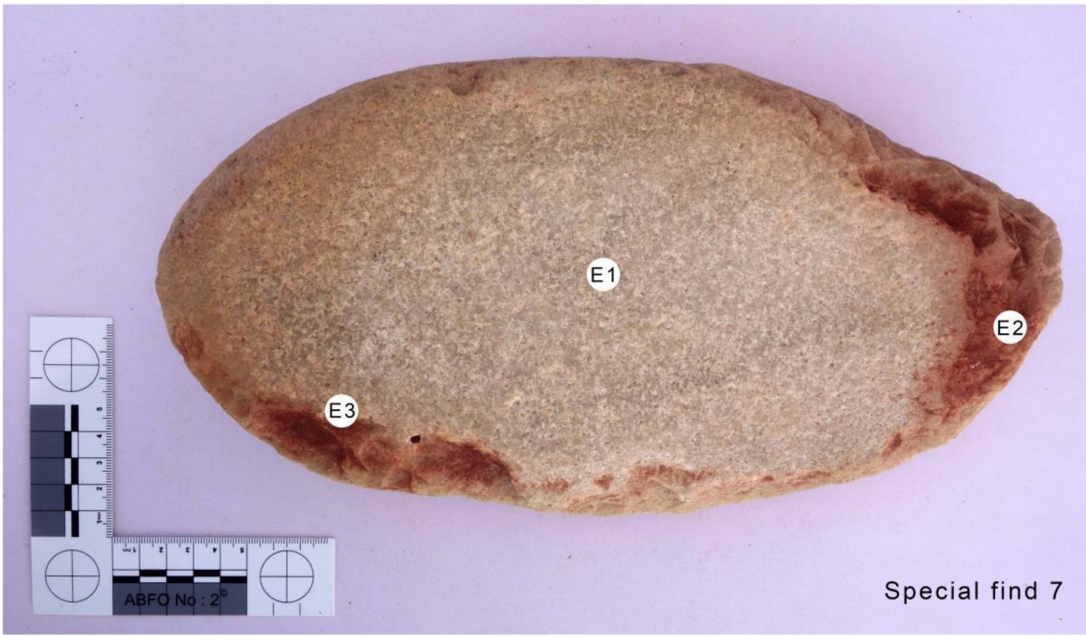
As already presented, different extraction points were selected for each artefact. Different tools showed compacted fine residues, not consisting with soil and firmly adhering to the tool's surfaces. These residues were mainly selected for sampling and analysis in order to investigate their nature and the possible presence of plant micro-remains. The inspection under microscope also allowed identifying the presence of soil. Areas with major presence of soil grit were excluded from analysis.

Due to the fact that soil adhering to the surfaces of the implements was low and clearly visible under inspection, the ground tools were sampled with no preparation. In case of special finds 13, 14, 15 and 45, due to the limited size of the working surface, being the items highly fragmentary, the residues were sampled from the whole surface. In case of special find 7, residues were ‘spot sampled’ (Torrence and Barton 2006) by targeting three specific areas (E1, E2, E3). The samples were extracted from all the special finds only through a dry sampling technique. No wet extraction was carried out.

In the dry sampling technique all residues that appear adhering on the surface, visible by naked eye or under microscopy, which appeared sufficiently large to be scraped off, were gently sampled by removing a portion of them using either a sterile aluminum blade or a sterile fine acupuncture needle.

The dry samples obtained in this way were directly placed on slide and a drop of ultrapure water was added to it in order to facilitate observations of the micro-fossils, as the liquid allow their rotation and therefore analysis of their 3D morphology. A coverslip was then place at top of the slide and kept in place by applying nail polished at each corner of it.

Once under the microscope, the entire area underneath the cover glass was examined at 500x magnification using the IFAO Leica high power microscope. All observations were completed using cross polarized light. The finds were recorded, described and documented by photographs.



Identification and quantification of the micro-debris

The identification of plant micro-remains is based upon comparison of morphological characteristics visible on the micro-debris with a built for the purpose reference collection of modern plants. Such reference collection consists of:

1) Plant species already identified in the plant macro-remains assemblage conducted by Mennath El Dorry.
2) Plant species with low archaeobotanical visibility, such as wild species of grasses, which are usually not present in the macro-botanical assemblages, as they do not survive well the charring process.
3) The identification of starch granules and phytoliths was also supported by a comparison with published data from a number of papers where such remains were studied not only in relation to stone tool, but also to pottery and human dental calculus (Madella et al., 2013; Tao et al., 2015; Torrence and Barton, 2006; Wang et al., 2015; Yang et al., 2012, 2014).

Further details on the identification process will be given in the results session. Descriptive terminology of starch granules follows the International Code for Starch Nomenclature (ICSN 2011, http://www.fossilfarm.org/ICSN/Code.html). Descriptive terminology for phytoliths follows a combination between Piperno (2006) and Madella et al. (2005). Plant nomenclature of identified starch granules follows Cope and Hosni (1991). Remains of organic origin were counted; therefore data represent absolute numbers.

Soil, mineral grit and contaminations

None of the samples of stone tools were found to be free of inorganic debris and small lumps of soil. This is to be expected as the stone tools were dug from a secure archaeological deposits and a certain quantity of soil could be attached to the plants which were processed. All potential areas where large lumps of soil were adhering to the tools and/or potential contaminants were clearly visible were omitted from the analysis. For all the samples that were selected for analysis, we recorded the presence of inorganic debris and soil based upon their presence on the field of view, following procedures also used in soil micro-morphology, to which we remind for details (FitzPatrick, 1980). To avoid modern contamination, extraction and mounting were conducted in a clean environment where no modern material had been processed, dust monitored and blanks with mounting medias were conducted on a regular base.

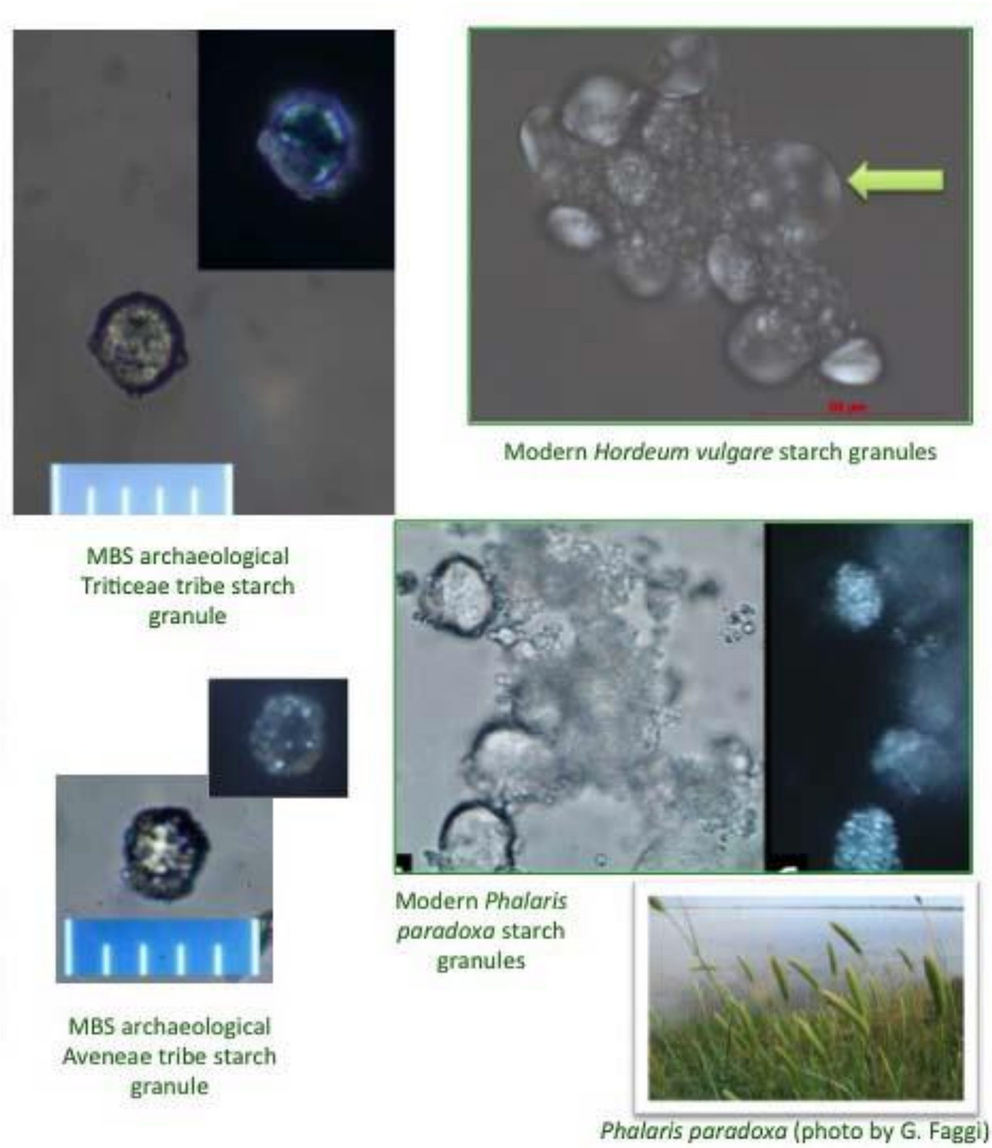
Results

The analysis yielded a variety of micro remains consisting with starch granules and phytoliths. Preservation of the remains was in its overall poor apart from few cases, and was observed in both starch granules and phytoliths preventing identification in many cases.

Special find / Extraction	**IFAO sample**	**Tririceae starch**	**Aveneae? starch**	**Undiagnost. starch**	**Cucurbitaceae phytolith**	**Long smooth phytolith**	**Long sinuate tuberculate phitolith**	**Wood**	**Undiag. plants**
SF7-E1	7560	0	x	xx	x	x	x	x	x
SF7-E2	7561	1	x	xx	x	x	x	x	x
SF7-E3	7562	0	x	xx	x	x	x	x	x
SF13-E1	7563	3	17	35+	4	3	3	1	x
SF14-E1	7564	2	12	3	4	2	2	2	x
SF15-E1	7565	2	12+	12	3	2	2	1	x
SF45-E1	7566	2	14	12	5	4	3	1	x

Starch granules

1. Triticeae tribe: they are lenticular and bimodal (Henry et al. 2009; Yang et al., 2012). The "bimodal distribution" of simple granules is a characteristic of most grasses of the Triticeae tribe (barley and wheat tribe) and some Bromideae, and it is now well-known to be under genetic control. It is characterised by the presence of both large granules of lenticular shape in 3D, with central hilum and few lamellae, and up to 40µm in diameter (A-type) and small almost spherical granules with a central hilum, ≤ 10µm in size (B-type).
2. Aveneae tribe: lumps of small polyhedral granules, very irregular in shape, ranging between 3 and 12µm in size, and forming large compound aggregates, overall oval in shape.
3. Undiagnostic starch granules, that could not be identified due to damage.

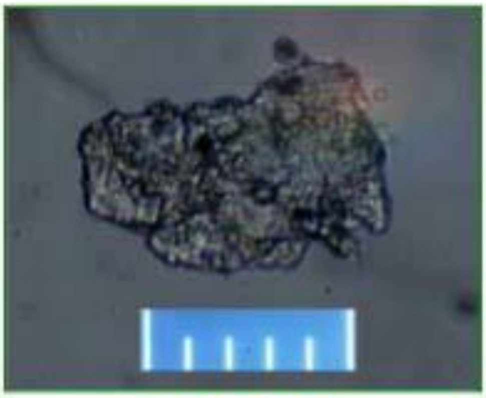


Phytoliths

Phytoliths were retrieved from almost all the tools. Most of them appeared broken, possibly due to the grinding action carried out on the plant material from which they have originated, but it is equally possible that they were damaged by transport in soil or wind. Little can be said about those types, as they have been badly damaged. However, considering some intact specimens, we could determine the presence of two types:

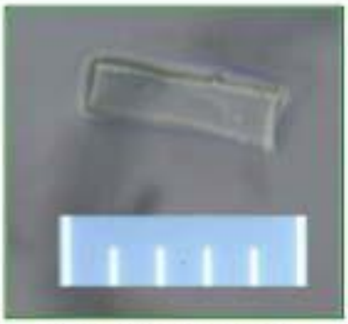
1. Morphotype 1: Long sinuate/tubercolate
2. Morphotype 2: Smooth elongate
3. Morphotype 3: irregular phytolith

Morphotypes 1 and 2 are very common in many species of monocotyledon and also dicotyledon plants and they are therefore not very diagnostic. However morphotype 3 resembles those related to gourds in both our reference collection and published work. They are very damaged and smoothened. Charred *Citrullus* type remains are present in the MBS macro remains assemblage; genus *Citrullus* (eg. *Citrullus colocynthis*) is widely distributed in Egypt. Although this is not eaten today for its bitter taste, it has medicinal properties.



Modern gourd phytolith
(Piperno 2009)

MBS archaeological Cucurbitaceae
(?) smoothened phytoliths.

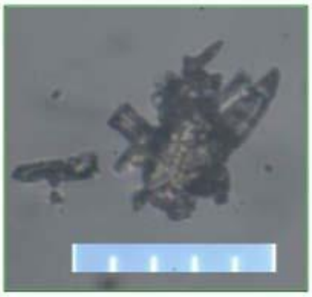


MBS archaeological
long smooth phytolith

Citrullus colocynthis
(commons.wikimedia.org)

Wood debris

Undiagnostic debris of plant origin was found in all samples, but only few fragments retained features to allow a match to an anatomical part of plants, and these were few remains of wood.



MBS archaeological wood debris

Discussion

The results points to both dietary and non dietary use §of the tools and are summarised below.

Dietary uses of the stone tools

At least three different types of starch granules were found from a minimum of three different species of plants. All tribes found could be present in the assemblage in multiple species so we cannot be sure if they were more than three. All the reported tribes include species of plant both wild and domesticated that are staple food for people. However all of them have also species of plants that are weeds of crops. So pathways of inclusion are multiple and the lack of precise identification does not allow us to fully understand if any of the species was domesticated.

The already known presence among the Merimde plant macro remains of domesticated species belonging to the tribe Triticeae, could suggest that domesticated species are the source of the bimodal starch granules.

Both the smooth elongate and the long sinuate/tubercolate phytoliths are present in their form in the tribe Triticeae, but also in several species of the Poaceae family. Thus it is not possible to use phytoliths to gain a better identification of the present species. This is also due to the fact that many are damaged and therefore their morphological characteristics are not always visible.

Non-dietary uses of tools

The presence of plant fibers and plant tissues, including wood tissue suggests that a variety of plant debris was possibly processed with the tools.

This could be explained in different ways:

1. The use of wooden tools in plant processing is documented in modern groups, such as Tuaregh. Wooden tools, such as spatulas, could have been used to scratch the tool's surface in order to collect the grounded residue from the surface of the tool. Such practice was directly observed by one of the authors during fieldwork in southern Libya.
2. The stone tool has been used to sharp wooden artefacts.
3. Stone tools could have been used to soften up and/or separate plant fiber for specific tasks, such as cordage.

All of the above activities could easily produce the debris observed on the tools. Equally, some of the plant material could be the result of plants ground as food, as testified by the presence of starch granules. Starch may have been diagenized, while the content of cellulose and lignin in fibers and tissue may have helped such debris to survive where starch granules did not.

The presence of phytolith coming from the rind of Cucurbitaceae (such as *Citrullus*) can also be explained in terms of non dietary use of the ground tools, as these could have been used to smooth up the container surface.

USE-WEAR ANALYSIS

Methodology

All the items selected for use-wear and plant micro-residue analysis come from secure and intact archaeological context. These tools underwent a double sonic bath: the first one, 40 minutes long, in water, and the second one, 60 minutes long, in water and washing up liquid. The surfaces of the tools were then casted with a non-destructive, high resolution, silicon based, impression material (PROVIL® novo). These casts were then exported to the McDonald Institute for Archaeological Research to be analyzed both at low- and high-power microscopy. A low-power observation and scanning of the selected tools' surface microtopography was carried out by means of a stereomicroscope Leica M250C at magnifications between 8x and

160x in order to characterize the tool’s micro topography and to detect the presence of particular macro wear, such as levelled areas, fractures, edge roundings and polish, following the definitions by Adams *et al.* (2009). Subsequently, surface’s polish, eventual striations and edge rounding detected on the tool’s topography and on the single quartz’s grains were observed and characterized through a high-power observation of the tools by means of a metallographic microscope Leica DM2700 at magnifications between 50x and 200x, and following the approach developed by A. Verbaas and C. Tsoraki (Leiden University). More in details, all the attributes of the polish have been observed and recorded: type; location and incidence; density and degree of linkage; development; reflectiveness; directionality. Description and directionality of striations were also recorded.

The micro-wear detected on the tools’ surfaces were compared with the ones present on experimental tools used for processing different kind of materials; these tools, which are part of the reference collection of the Laboratory for Artefact Studies, Leiden University, included:

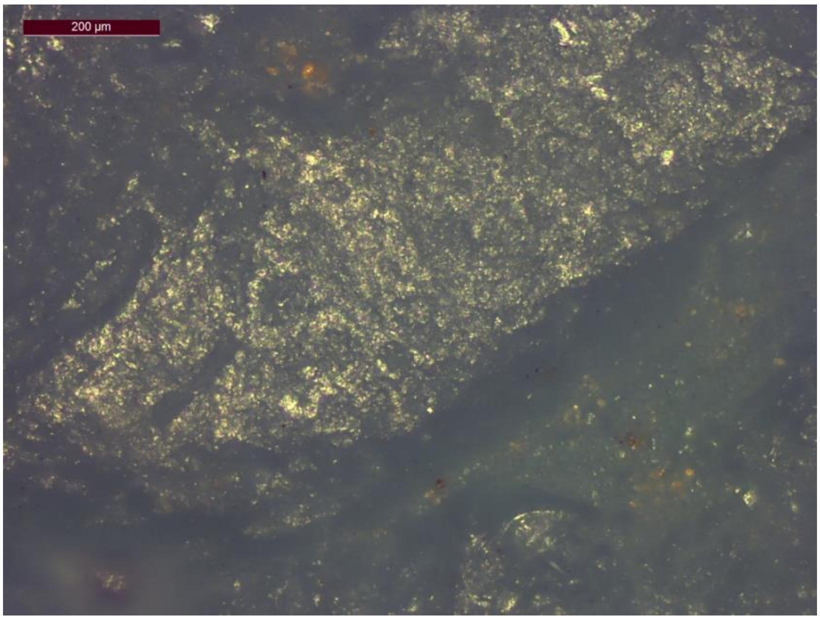
Laboratory experiment ID	**Tool type**	**Raw material**	**Type of activity**	**Processed material**	**Time of use**
Leiden-983	Polisher	Stone	Polishing	Dry leather-hard clay	325 minutes
Leiden-995	Polisher	Stone	Polishing	Dry leather-hard clay	425 minutes
Leiden-996	Polisher	Stone	Polishing	Dry leather-hard clay	345 minutes
Leiden-1310	Polisher	Sandstone	Polishing	Fresh Juniper wood	180 minutes
Leiden-1317	Grinder	Sandstone	Grinding	Basalt	160 minutes
Leiden-1318	Grinder	Sandstone	Grinding	Ochre	160 minutes
Leiden-1321	Grinder	Sandstone	Grinding	Soaked bone and antler (in different areas)	180 minutes
Leiden-1322	Grinder	Sandstone	Grinding	Flint	180 minutes
Leiden-1368	Grinder	Sandstone	Grinding	Hazel wood	3200 strokes
Leiden-1648	Quern	Sandstone	Milling	Dry Einkorn wheat	600 minutes
Leiden-1649	Quern	Sandstone	Milling	Dry Einkorn wheat	600 minutes
Leiden-1654	Quern	Sandstone	Milling	Dry Einkorn wheat	600 minutes

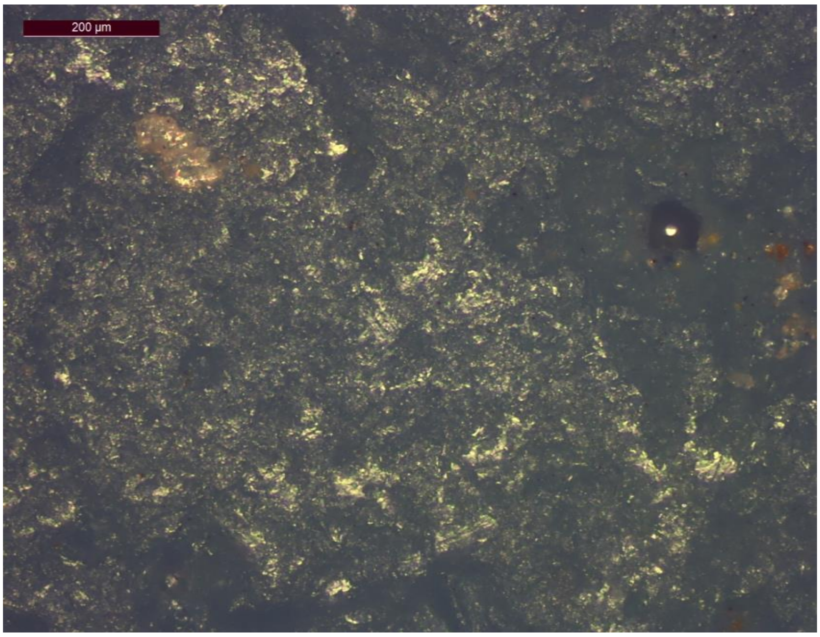
Results

At low power of observations, the surfaces show very pronounced levelled areas. These were caused by a prolonged use of the tools which lead to the smoothing of the rough surfaces, eventually creating a polish on the artefacts’ grinding surfaces. It is not uncommon to find the most levelled areas associated with presence of polish. Both grain fracturing and extraction, sometimes quite deep, are also present especially on the central areas of the surfaces. These were caused by surface rejuvenation activities, such as repecking. Extremely smoothed surface could become ineffective, and that is why the tools often needed re-pecking by means of a pointed tool, in order to give the stone back the correct degree of roughness and abrasiveness.

At the high power observation, polish appears granular, or spider-web like, and it is quite reflective. It is present, in patches, all over the tools’ surface; it affects not only the high microtopography but also the grain's intermediate areas. It develops on the grains' crests in an elongated way, in correspondence of a quite pronounced rounding of the grain's working edge.

Comparing the micro-wear present on the experimental tools with that detected on the archaeological grinders, it appears clear that the granular appearance of the polish resulting from grinding dry einkorn wheat, its incidence on high and low microtopography, high reflectivity and patchy development, closely resembles the granular / spider-web like one detected on the archaeological tools. This confirms that these grinders were surely used in plant processing activities.





Microscopic images showing use-wear to be associated to plant processing activities.

Archaeobotanical Analysis of Merimde Beni Salama Samples at Institut Français d'Archéologie Orientale (IFAO), Cairo

Analysis by: Mennat-Allah El Dorry, January 2016 analysis carried out by M. El Dorry and Rania Saied (National Museum of Egyptian Civilization) March 2016 analysis carried out by M. El Dorry, R. Saied and Esam Ahmed (National Museum of Egyptian Civilization)

The plant macro remains' samples were packed up for analysis and sent to IFAO in summer 2015 were analysed over January and March 2016.

Cereal items were few and far in-between, and these were mostly from MBS14S T2-D (55), and one from the nearly site of el-Qatta Test Trenches.[1] Pulse items were not recorded except for one indeterminate fragment in Bot 20/IFAO 7529. Otherwise, samples were dominated by weeds and wild taxa at over 1000 recorded items. In addition, Indeterminates were or course also present.

What was observed is that the samples with charred cereal remains (mostly those similar to *T. dicoccum* items, were poorly preserved and cannot be securely identified) do not have any of the other weeds and wild taxa found in the cereal-free samples. This is suggested here as being an indication that the samples with cereals are ancient, while the others could very well be modern deposits, especially with the large amount of uncharred taxa that are commonly found in the desert.

[1] Bot 1/ IFAO 7510
JR1/ IFAO 7541
JR7 / IFAO 7547
JR12 / IFAO 7552
Bot 31/IFAO 7540

Archaeobotanical Analysis at Merimde Beni Salama, Winter 2016 Field Season

Analysis by Mennat-Allah El Dorry,

Samples were chosen for floatation based on their promising ashy colour and on the suggestion of the excavators. Samples tended to be very limited in contents. In many cases, only a litre or half litre subsample was floated first before then being discarded or processed in full.

One context, however, which had been located during the excavation of a foundation trench for the building of a protective wall around the registered antiquities' land (1018). Around 26 litres of this sample (i.e. all available) were floated. A cursory look with the naked eye during flotation showed it was full of *T. dicoccum* (emmer wheat) grains, with occasional barley grains, in addition to pulse/legume types. It looked very similar to what had already been assessed (also by M. El Dorry) in Stockholm and Heidelberg (on the collections of plant material from Junker's excavations at the site in tine 1930s). It would be of interest to compare (1018) as a sample where the methodology is clear (with regards to mesh size and therefore the recovery of small items) with material from Junker's work to look at inclusion of small items. The botanical sample number from the bulk sample was given Bot 31, and each other bag was given a single number (Bot 32, 33, 34, 35, and 36). Each 1.6 litres were bagged separately (unless otherwise stated on the bags).This will allow for the samples to be approached in detail, and for comparison of the different subsamples to one another (to see if the subsampling has resulted in different sorts of material and ratios). The sample will be perfect for teaching, in addition, especially as they are divided up in small amounts.

The charcoal from the 1978 Excavations at Merimde, Egypt

Analysis by A.J. Clapham

Summary

Eighteen samples of mostly charcoal were provided for analysis. There were a limited number of taxa identified, including, Chenopodiaceae, tamarisk, acacia, willow, possible *Ephedra* sp, Christ's thorn, palm and reed remains.

The identification of the charcoal suggests an environment where water was present for part of the year, although desert elements are present too. This suggests that at the time of occupation in the Neolithic, Merimde had a water supply but there were also indications that drier conditions were beginning to encroach.

Introduction

A total of eighteen samples were provided for charcoal analysis. These are listed in Table 1. The samples provided all contained charcoal which in the majority of cases was identifiable to genus. A limited range of taxa were identified but whether this was due to the limited number of trees species available in the vicinity of the site or to selection of a specific taxon for a specific purpose is difficult ascertain.

The taxa identified allow some interpretation of the environment in which the occupants of Merimde lived.

Context	MBS Phase	Type of Context	Conifer cf *Ephedra* sp	*Salix* sp	Chenopodiaceae	cf *Capparis spinosa* fruit	*Acacia* sp	*Ziziphus* sp	*Tamarix* sp	Palmae	*Phragmites/Arundo* sp
MB78 SI 72 IV							2bw+5rw		3bw		
MB78 SIII 15?	III	Basket pit					2bw	1bw	6bw		1cn
MB78 SI 38 VII	II	Hearth					1bw+1rw		6bw+2rw		
MB78 SI 51 III		Post-hole					1bw+3rw				1cb+1rhiz
MB78 SI 31 IX							1bw+4rw		4bw+1rw		
MB78 SIII 76/[14] VI							4hw		4hw	2	
MB78 SI 31 VIII							10bw				
MB78 SIII 75[14] VI			3rw				3bw+1rw		2bw+1rw		
MB78 SIII 36[13] VII	III	Basket pit					6bw+2rw		2bw		
MB78 SIII 65[14] VI			1rw				7bw+1rw		1rw		
MB78 SI 78 IV						1	4bw+4rw		1bw		
MB78 SI [37] XII		I			1rw		6bw		3bw		
MB78 SIII 75[14] VII							5bw+1rw		4bw		
MB78 SI? ?7 VII				9bw			1bw				
MB78 SIII [14] V				1bw			3bw		6bw		
MB78 SI 34 VII							10bw				
MB78 SV 54 VI							6bw		4bw		
MB78 SI [38] XII					1rw		2bw		6bw		1rhiz

Table 1 Charcoal and other material identified from Merimde MB78. (bw = branchwood; rw = roundwood; cb = culm base; cn = culm node; rhiz = rhizome)

Methods

Eighteen samples from Merimde excavations in 1978 were provided for charcoal analysis. Due to the limited time available it was decided that where possible 10 pieces of charcoal would be identified. This should be enough to determine the range of taxa used for fuel.

Overall, the charcoal was well preserved although several samples contained pieces that were either vitrified or badly distorted and therefore hindering identification.

Each charcoal piece was examined in 3 planes (transverse section (ts), tangential longitudinal section (tls) and radial longitudinal section (rls). This permits a more accurate identification of each piece of charcoal.

A low-power zoom stereomicroscope (x7-x45) was used to determine the quality of each charcoal piece and then to help with creating a clean section in order for the piece to be examined using an Olympus BHM epi-illuminating (light/dark field) with magnifications of x50, x100, x200 and x500.

In normal circumstances a modern reference collection and wood anatomy atlases would be used in combination to accurately identify the charcoal fragments, but in this case no modern wood reference collection for the area was available and therefore only wood anatomy atlases could be used. The relevant one used here was Neumann et al (2001).

The work using was carried out in the laboratories housed in the Department of Classics, History and Archaeology of the University of Edinburgh.

Results

A total of 156 fragments were identified from 18 samples. Fifteen samples each provided 10 pieces of charcoal for identification with one providing 6 pieces. The results are presented in Table 1. Most of the charcoal fragments were most likely from medium to large branches rather than main trunks. A proportion (24.5%) of the charcoal is from small twig or roundwood with between 1 and 4 annual rings. The domination of branch wood (75.5%) suggests that the occupants of Neolithic Merimde were collecting fallen branches rather than chopping trees down. Acacia charcoal dominates the assemblage in both the proportion of branchwood and roundwood. Apart from charcoal other remains were recovered including a culm node and culm base of reed (*Arundo sp/Phragmite*s sp) and two fragments of reed rhizome. A possible fragment of a *Capparis spinosa* fruit was also present in one of the samples, see Table 1.

The diversity of woody taxa in the samples was rather limited, see Table 1 and Figure 1a. The two dominant taxa being acacia and tamarisk with 57% and 33% respectively. Other species found included conifer, possibly *Ephedra* sp, willow (*Salix* sp, most likely *Salix mucronata*), a chenopod (most likely either *Atriplex* sp or *Salsola* sp), *Ziziphus* sp (most likely *Ziziphus spina-christi*) and palm (most likely *Hyphanea* and not *Phoenix* given the date of the site).

The branch wood (Figure 1b) was present in similar proportions to the overall numbers, where there was a difference was the small diameter (10-20mm) roundwood charcoal (Figure 1c). Acacia was still the commonest find but tamarisk was reduced by over half. This was the result of the presence of small diameter chenopod and conifer (cf *Ephedra*) wood at 12% and 6% respectively. No small diameter roundwood of *Salix*, *Ziziphus* or palm were recorded. The wood of both Ephedra and the chenopod wood are shrubby species and therefore only small diameter charcoal is going to be represented.

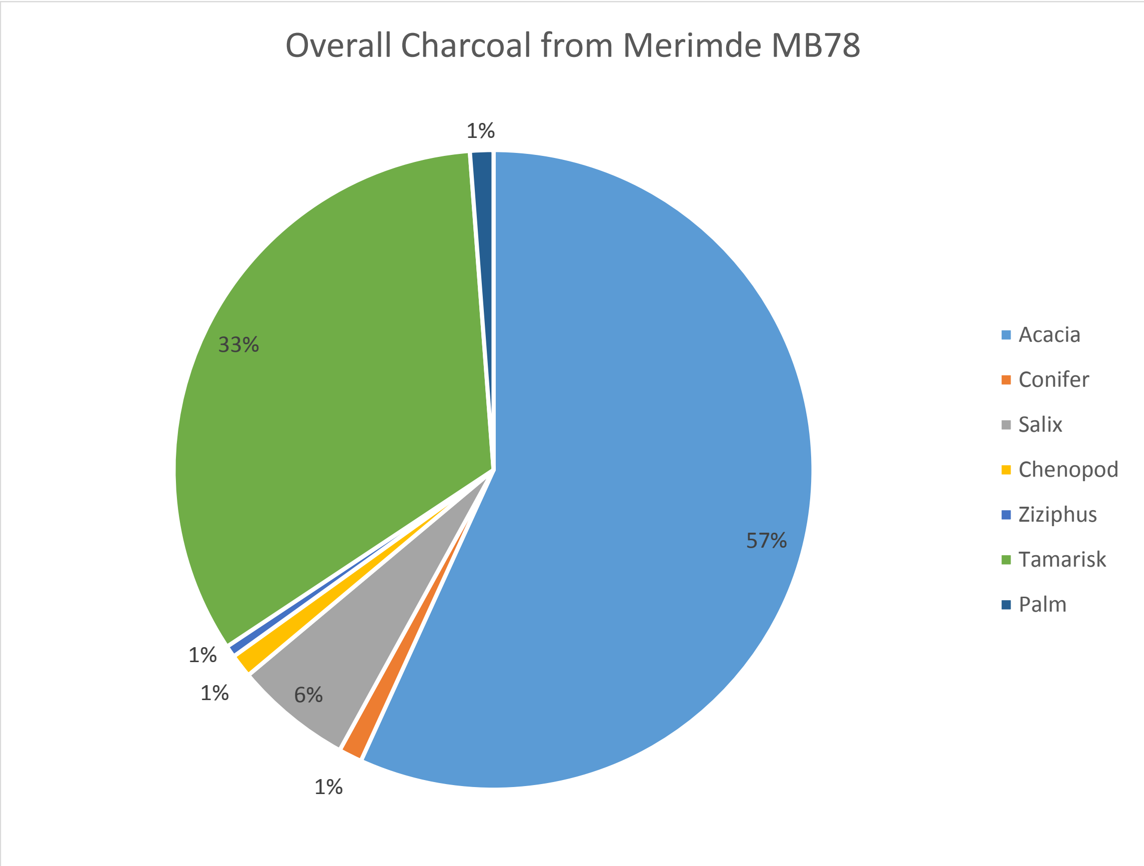


Figure 1a

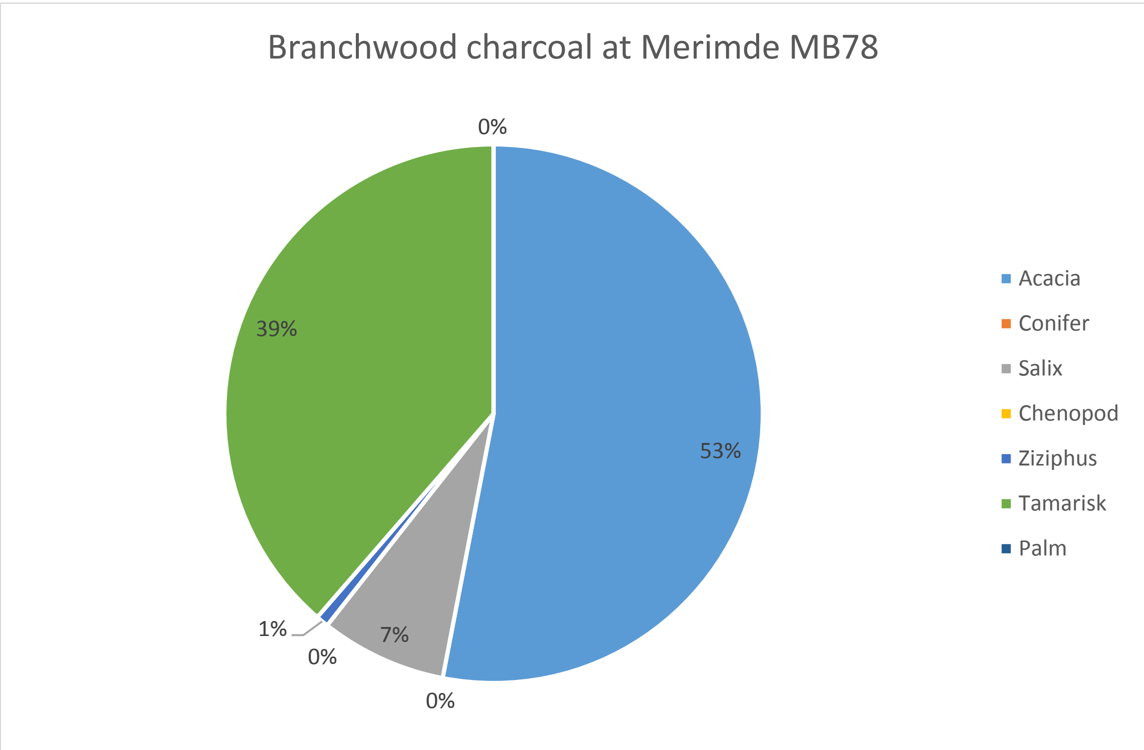


Figure 1b

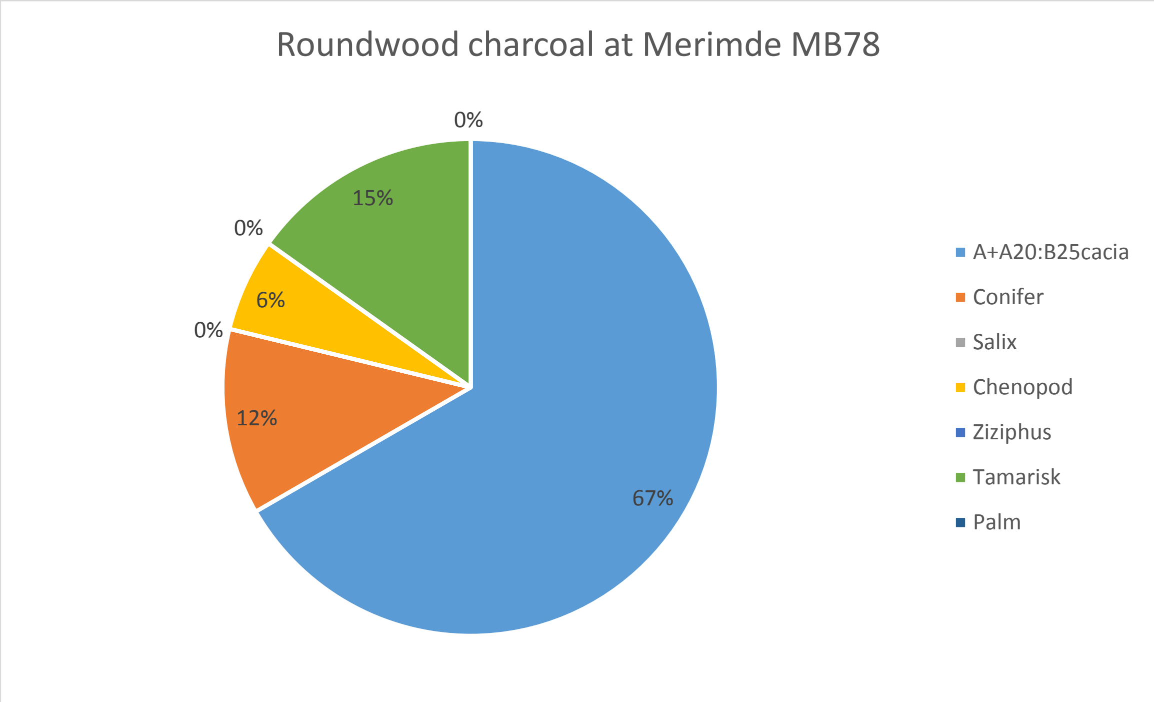


Figure 1c

Conifer* cf *Ephedra sp (Ephedraceae)

Conifer (cf *Ephedra* sp), is present in two of the samples (see Table 1) with 4 pieces of small diameter roundwood. This makes up 12% of the total of small diameter roundwood.

Ephedra sp belongs to the Ephedraceae family of conifers of which Ephedra is the only genus (Boulos 1999). There are 5 species of Ephedra found naturally in Egypt. All 5 species are shrubs, ranging from less than 1m to 4m in height. Some are erect shrubs while others can be found scrambling or climbing over other shrubs or trees (Boulos, 1999). All the 5 species are dioecious, where there are male and female flowers on separate plants. It is not possible to tell the sex from the wood anatomy. The fruits are cones. They are all xeromorphic shrubs adapted to desert conditions usually with much reduced leaves.

Two of the species, *E. alata* Decne, and *E. aphylla* Forssk., are found in desert conditions with *E. alata* preferring desert sandy plains and *E. aphylla* is found on calcareous slopes and wadi beds.

Ephedra ciliata Fischer & A.C. Mey. Is found in the eastern desert, Gebel Elba and Sinai. *E. foemina* Forssk. and *E. pachyclada* Boiss., are both found in Sinai with both growing on rocky cliffs. *E. pachyclada* has a more eastern distribution.

Given the distribution of the 5 species it is most likely that the charcoal identified here is of either *E. alata* or *E. aphylla* (or both). *E. alata* is a small erect richly branching shrub to 1m and is never found climbing (Boulos, 1999) and *E. aphylla* can be either erect or hanging shrub up to 1.5m.

***Salix* sp** (Salicaceae)

Salix sp., willow is the only native genus of the family Salicaceae in Egypt. There is only one native species of willow in Egypt which is *Salix mucronata* Thunb. Therefore, the charcoal identified here must be of this species. *Salix mucronata* is a dioecious shrub or tree to 8m. The male trees are less common than female trees. Willow is found in the Nile valley, the oases, Mediterranean coastal region, the eastern desert and the Sinai Peninsula (Boulos, 1999). The bark of this species is a source of salicylic acid (modern day aspirin) and was of great importance for the treatment of rheumatic pains and as a general painkiller (el-Hadidi & Boulos, 1988). Whether the inhabitants of Merimde were aware of this property is difficult to prove.

Chenopodiaceae

The majority of the goosefoot family (Chenopodiaceae) are usually herbaceous annuals (Boulos, 1999) but there are several genera that can be either shrubs or small trees. These include *Anabasis, Arthrocnemum, Atriplex, Cornulaca, Haloxylon, Noaea, Salsola, Seidlitzia, Sevada*, and *Traganum* (Boulos, 1999: Neumann et al, 2001).

These genera are either found in saline conditions such as salt marshes or where there are saline soils and in deserts. It is difficult to say which of the taxa the charcoal from Merimde belongs to, but it is most likely to have been collected from the desert edge.

cf *Capparis spinosa L.* (Capparaceae)

This find was not of charcoal but of a small mass of indeterminate plant material within which seeds were embedded. The seeds were reminiscent of *Capparis spinosa* but without the relevant reference material is was not possible to be sure.

The genus Capparis in Egypt is composed of shrubs, trees or woody climbers (Boulos, 1999). *Capparis spinosa*, the flower buds of which are eaten as capers is found on rocky slopes, desert wadis and plains.

***Acacia* sp** (Fabaceae)

There are 10 species of Acacia native to Egypt, several with one subspecies (Boulos, 1999) and differentiating between the species using wood anatomy alone is very difficult. Most the species in Egypt are found growing in desert conditions. There are two species, *Acacia nilotica* (L.) Delile and *Acacia seyal* Delile., which are found in the Nile valley, the latter species is only found in southern Egypt today between Qena and Aswan (Boulos, 1999). Therefore, it is most likely that the charcoal is most likely of *Acacia nilotica* given the proximity of the site to the old course of the Nile.

Acacia nilotica is a tree 3-15m high and is easily identified when in fruit with its flattened pods which are constricted between the seeds (el-Hadidi & Boulos, 1988; Boulos, 1999). The foliage and green pods are eaten by livestock and the seeds provide a highly nutritive food for cattle (el-Hadidi & Boulos, 1988). The pods have been used for tanning, especially goat hides. The pods can also be used to produce a blue dye.

The wood has many uses, such as the construction of boats, water wheels, shadufs and water pipes as its resin content makes the wood resistant to water and insects. The wood is often used for making charcoal (el-Hadidi & Boulos, 1988).

***Tamarix* sp** (Tamaricaceae)

There six species of tamarisk that are native to Egypt (Boulos, 2000). They are either trees or shrubs which are profusely branched. The two most common species are *Tamarix aphylla* (L.) H. Karst. And *Tamarix nilotica* (Ehrenb.) Bunge,Tent.

Tamarix aphylla and *Tamarix nilotica* can be found growing on saline soils. *Tamarix aphylla* can also be found in desert wadis and on sandy plains, but today it is often cultivated in coastal and desert regions as a windbreak and for its timber and shade (Boulos, 2000). *Tamarix nilotica* can be found on the edges of salt marshes and on coastal and inland sandy plains (Boulos, 2000). It is often encountered on the banks of the Nile.

Which of the two species is represented here is difficult to decide as they difficult to split on anatomical grounds. It is likely that both species were exploited if the desert and banks of the Nile were exploited by the inhabitants of Merimde.

***Ziziphus* sp** (Rhamnaceae)

There are three species of Ziziphus growing in Modern Egypt. *Z. spina-christi* (L.) Desf., *Z. lotus* (L.) Lam., and *Z. nummularia* (Burm. f.) Wight & Walk. The latter species is extremely rare and only known form one location (Boulos, 2000), and Z. lotus is more of a Mediterranean taxon. Therefore, it is most likely that the charcoal of *Ziziphus* at Merimde is of *Ziziphus spina-christi*. This evergreen 4-8m tree can be found growing all over Egypt in the Nile valley as well as desert areas (Boulos, 2000).

The fruits are edible and produces good timber and shade.

Palmae

There are two species of palm which can be said to be native to Egypt, the dom palm (*Hyphaene thebaica* (L.) Mart.) and the argun palm (*Medemia argun*). A third palm, the date palm (*Phoenix dactylifera* L.) is a common feature of the Egyptian countryside but its origins are unknown and therefore it is thought not to be native to Egypt.

The dom palm can be between 5-25m tall (Boulos, 2005) and is the only branching palm known in Egypt, it is most common in modern times in southern Egypt, especially in the Aswan area but it is thought that it distribution in the past was much wider and further north as the remains of the fruits are found on many archaeological sites of a wide date range throughout Egypt. The fruit is edible and is said to have medicinal properties (Boulos, 2005).

The argun palm's modern distribution is limited to two southern oases (Dungul and Nakhila) (Boulos, 2005). The fruits have been found on some archaeological sites so its distribution in the past may well have been wider. The kernel is often used for making buttons, having a similar pattern as ivory when worked.

It was not possible to determine which species the palm charcoal from Merimde belonged to and further work is required to see if this is possible. The possibility that the charcoal is of date palm cannot be ruled out. If it is indeed date charcoal, this may well be a very early record for date palms in Egypt.

***Phragmites/Arundo* sp** (Poaceae)

The finds of large grass culm bases, culm nodes and fragments are suggestive of reed. It was not possible to say whether these were of the common reed (*Phragmites australis* (Cav.) Trin. Ex Steud.) or of giant reed (*Arundo donax* L.). In modern times the giant reed rarely occurs as a native but its presence in the past cannot be ruled out.

Common reed as the name suggests is very common in Egypt and can be found in many watercourses and is often considered to be a very invasive species causing much damage to buildings and other structures. It can spread very quickly, and one plant can cover a vast area.

Both species are dependent on water and therefore must have collected by the inhabitants of Merimde. The presence of a fragment of rhizome may suggest it was growing locally.

The fact that the main structures of Merimde were of reed shelters, huts and fences it may be suggested that this was the source of the charred material.

Discussion

The majority of the wood taxa identified from this short study (*Ephedra* sp, *Acacia* sp, *Tamarix* sp and Chenopodiaceae) can be considered to be desert species. The presence of the Chenopodiaceae component in the assemblage may suggest the presence of salt pans whereby winter rainfall has evaporated leaving behind a salt crust.

The presence of other woody taxa such as sidder (*Ziziphus* sp), palm (most likely *Hyphaene thebaica*) suggest more moist conditions as does the presence of willow (*Salix* sp) and the culm nodes and rhizomes of common reed. These last two taxa most likely indicate the proximity of one of the branches of the Nile with both species being dependent on a constant water supply.

Charcoal studies in this area of Egypt at this period of occupation are basically non-existent and therefore the work here is of some importance. According to Neumann (1989) in the early and middle Holocene the dominant woody taxa in Egypt north of 25°N were *Acacia* sp, *Tamarix* sp and Chenopodiaceae which agrees with the findings of this study. This suggests that by the middle Holocene, desert conditions were beginning to prevail and are still present today.

The inhabitants of Merimde appear to exploit both the desert edge and the riverine environment to gather fuel and perhaps construction material. It would be interesting to see if this pattern was reflected in the seeds and other non-charcoal plant remains recovered from the site at the same time.

The samples below are considered suitable for radiocarbon dating, and will then be selected after discussion with the excavator, Dr Josef Eiwanger at the German Archaeological Institute in Bonn.

Context	**Radiocarbon dating**
MB78 SI 72 IV	*Acacia* sp rw
MB78 SIII 15?	*Phragmites/Arundo* sp cn
MB78 SI 38 VII	*Acacia* sp rw
MB78 SI 51 III	*Phragmites/Arundo* sp rhiz
MB78 SIII 75[14] VI	Conifer/cf *Ephedra* sp rw
MB78 SIII 65[14] VI	Conifer/cf *Ephedra* sp rw
MB78 SI 78 IV	*Acacia* sp rw
MB78 SI [37] XII	Chenopodiaceae rw
MB78 SIII 75[14] VII	*Acacia* sp rw
MB78 SI [38] XII	Chenopodiaceae rw, *Phragmites/Arundo* sp rhiz

Table 2 Samples with suitable material for Radiocarbon dating from MB78 (rw = roundwood; cn = culm node; rhiz = rhizome)

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