Archaeobotanical studies at Hierakonpolis Locality HK6: The Pre and Early Dynastic elite cemetery

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Plant macroremains were separated from samples taken from nine tombs (1-3, 5-7, 9-11) in an elite cemetery at locality HK6 at Hierakonpolis. These tombs are dated to the Predynastic Naqada IIA period and the Early Dynastic Naqada A2-IIIC1 (c. 3800 – 3650 B.C./ 3200 – 3050 B.C.). Human and/or animal skeletal remains were found in all of these tombs. A total of 1984 plant macroremains were identified. This botanical assemblage has been attributed to 23 plant taxa and classified into wild edible fruits, cultivated crops, wild herbs, wood and charcoal. The highest number and percentage of plant remains as well as the greatest number of plant species were recorded from Tombs 1, 3 and 11. The current study shows that the Predynastic inhabitants depended heavily for wood and fuel on native trees, e.g., Acacia nilotica, Ficus sp, Tamarix aphylla, Tamarix nilotica and Ziziphus spina-christi. From the remains it was also possible to reconstruct the characteristic habitats and plant communities that flourished in the general vicinity of the site: 1) a contracted desert vegetation dominated by Acacia nilotica, Balanites aegyptiaca, Capparis decidua, Fagonia bruguieri, Ficus sycomorus and Tamarix aphylla; 2) a contracted ground water-bound desert vegetation included Acacia nilotica, Desmostachya/Imperata and Tamarix; 3) a swampy habitat characterized by stands of Phragmites, Desmostachya/Imperata, Cyperus alopecuroides and Tamarix nilotica. Remains of conifer trees, e.g., Cedrus libani, Cupressus sempervirens, Pinus halepensis, have been found in very small numbers. They may have been imported into Egypt from the Levant.

Keywords: Archaeobotany - Hierakonpolis - Elite Cemetery - Past vegetation - Egypt

Introduction

Hierakonpolis, an archaeological site in Upper Egypt that flourished in the Predynastic period, is considered by many archaeologists and historians to be a key locality for understanding the beginnings of Pharaonic civilization (Hoffman 1982). Remains of predynastic occupation cover an area of over 6 km^2 in the low desert, and extended into the now cultivated plain for an undetermined distance. Excavations have been undertaken at several low desert localities (viz. HK6, 11, 11C, 24A, 25d, 29, 29A, and 43) and archaeobotanical studies on material collected derived from them have been undertaken (El-Hadidi 1982; Fahmy 1995; Fahmy & Barakat 2000; Fahmy 2003; Fahmy 2005; Friedman *et al.* 1999; 2002). In this paper we focus on the plant material retrieved from the elite Predynastic and Early Dynastic cemetery at locality HK6 during the 1979-1985 campaigns, which could not be included in the comprehensive publication of those excavations by Adams (2000).

Geography and archaeological setting of the study area

Hierakonpolis is located in the southern sub-province of the Western Desert of Egypt, about 113 km north of Aswan, between the modern towns of Esna and Edfu (latitude 25 05' and longitude 32 45'-50')[1]. The desert portion of the site stretches for about 3 km along the edge of the low desert and extends 3 km into the Western Desert along the ancient drainage course of the Wadi Abul-Suffian. Locality HK6 is a large cemetery area which lies about 2.1 km southwest of the edge of the cultivation on the west side of the Wadi. The cemetery occupies a relatively flat terrace of late Pleistocene silts and is flanked by steep sandstone hills. The site extends for approximately 240 m in a roughly north-south direction and has a maximum width of at least 90 m (Friedman this volume: fig. 2; Adams 2004). A sample of tombs extending along the north-south axis of the cemetery was excavated by Michael Hoffman and his team from 1979 to 1985. Excavations were subsequently resumed in 1997 to 2000 by Barbara Adams (2002; 2004), and thereafter continued under the direction of Renée Friedman (2004a; in press), resulting in the discovery of many more tombs (currently 28 is the cemetery total), the plant remains from which are part of a different study. **Table 1** gives a brief description and date for only those tombs discussed in this paper.

The tombs under discussion fall into two temporal groups; those dating to the Naqada IIA period found in a cluster at the south end of the cemetery (Tombs 3, 5, 6 and 9) and the larger brick-lined tombs of the Naqada III period (Tombs 1, 2, 10, and 11) whose construction appears to have disturbed or destroyed tombs of the earlier phases (Adams 2000). All of the tombs have been disturbed to some extent. The large tombs 1, 2 and 10 have essentially been emptied, possibly as a result of earlier excavations in addition to several events of plunder. The disturbances make precise the date and context of the botanic remains difficult to determine.

While some tombs still contained indications of their formerly rich contents, elite status has been conferred mainly on the basis of the large size of the tomb chambers in relation to others throughout Egypt of the same time period. In addition, the cemetery has several unique and possibly

1. See Friedman this volume: fig. 1.

Tomb	Type of burial	interments	Dating (Naqada)
1	Brick lined, surrounded by fence Internal L: 6.5 W: 3.5 D: 2.5m	1 human adult femur only	IIIB-IIIC1
2	Rock cut chamber with side room L: 6.25 W: 2.1 D: 4.1m	4 fragmentary human individuals and numerous animals (some intrusive?)	III?
3	Roughly rectangular L: 3.0 W: 2.6 D: 1.80 m.	3 human individuals 2 subadult goats	IIA
5	Oval – L: 1.2 W: 0.75 D: 0.40 m.	7 dogs + 2 human individuals –intrusive?	IIA
6	Rectangular – L: 2.9 W: 1.60 D: 1.5 m.	2 adults, 3 juvenile human	IIA
7	Roughly rectangular L: 2.5 W: 2.1 D: 0.75m	5 cattle with matting	III?
9	Rectangular – L: 2.0 W: 1.1 D: 1.25m.	One young adult – 3 dog skulls	IIA
10	Brick lined, surrounded by fence L: 4.75 W: 2.7 D: 1.75m	No human bones retrieved Minor animal (capride, cattle)	IIIA2-IIIB
11	Brick lined, surrounded by fence. L: 4.9 W: 2.4 D: 2.0m	Human 10-12 years 6 sheep/goat	IIIA2

Table 1
Summary of the tombs in the HK 6 cemetery discussed in this paper.

status related aspects, amongst them, the high number of animal remains (both whole and partial carcasses of domestic and/or wild animals) recovered from tombs with and without accompanying human occupants (*e.g.* Tombs 5, 7, 9; see van Neer *et al.* 2004); and the presence of superstructures and/or enclosure walls of wood and matting surrounding the grave pits. Substantial indications of above-ground wooden architecture was observed in associations with the Naqada III brick-lined Tombs 1, 10, 11, and recent work (Friedman in press) shows that similar structures were also present in the earlier Naqada II phase, but whether the tombs included in this study were so equipped requires verification by future archaeological investigations.

A number of soil samples were collected from the mounds of back dirt flanking the Naqada III brick-lined Tomb 11 on the southwest (grid square 170N25E), the north (180N25E) and northeast (180N35E). While the surface layers contained materials thrown out of the tomb itself during plunder, the lower levels of these mounds contained a large amount of Naqada II material and it has been suggested that these mounds were created when the tomb was dug, disturbing earlier graves in the vicinity. The foundations for the post fence surround the tomb were cut into these mounds of earlier material and reinforce this interpretation (Adams 2000: 27). A mixture of materials from potentially different time periods has also been noted amongst the faunal remains collected from around this tomb (Van Neer *et al.* 2004: 81-2). Thus, where possible, the botanical material from the mounds has been listed separately in the tables given below, the location of one mound being unspecified.

Climate of the study area

The Western Desert in Egypt is one of the most arid parts of the globe (Bornkamm & Kehl 1989), and is part of Zonobiome III, the zone of subtropical arid deserts (Walter 1984). This great aridity results from its distant position from the sea, and the absence of high altitude features,

which may attract orographic rain (Zahran & Willis 1992). According to the Climatic Normals of Egypt (Anonymous 1960), the climatic records of two metrological stations, one at Aswan to the south and the other at Qena to the north of Hierakonpolis, show that the area has an extremely arid climate (high temperature, low relative humidity, high evaporation and very low rainfall, 1.4-5.3 mm/year), although two strong thunder storms were recorded during May and October 1979. These exceptional events resulted in heavy rainfalls (175 mm) according to Luxor metrological records and their effect was felt at Hierakonpolis.

Present vegetation of the study area

Three zones of recent vegetation are recognized around the archaeological site of Hierakonpolis. The first zone constitutes the cultivated land on the Nile flood plain. Some of the field crops cultivated there are: *Saccharum officinarum*, *Zea mays* and *Gossypium barbadense* as summer crops; *Triticum vulgare, Hordeum vulgare, Trifolium alexandrinum* and *Medicago sativa* as winter crops. Many vegetables, such as *Eruca sativa, Allium cepa, Allium sativum, Corchorus olitorius, Cucumis sativus, Cucumis melo, Citrullus vulgare* and *Solanum lycopersicum* are cultivated in limited areas. The second zone occupies the border between the desert and cultivation. Considerable areas are left fallow, being on or adjacent to archaeological sites of various periods. The underground water is about 40 cm below surface in the flood plain providing a favorable habitat for the growth of dense populations of *Imperata cylindrica, Desmostachya bipinnata* and *Phragmites australis* with few dispersed trees of *Tamarix nilotica, T. aphylla* and *Acacia nilotica*. The third zone is an arid desert habitat with scanty plant cover consisting of a few scattered shrublets confined to the main channel of the wadi. The presence of this type of vegetation can be attributed to the absence of precipitation and the poor availability of underground water. *Salsola baryosoma* and *Pulicaria crispa* are the dominant species; common associates are *Fagonia indica*, *F. bruguieri, Hyoscyamus muticus* and *Morettia philaena*. Annual species recorded are *Launaea capitata* and *Astragalus vogelii.*

Archaeobotany of Cemetery HK 6

Previous archaeobotanical studies have been carried out on only a selection of botanical material retrieved from tombs in the HK6 cemetery. M. Nabil El Hadidi of the Cairo University Herbarium was responsible for identifying the plant species from Hoffman's work in the cemetery in 1979-1982. The results of his analysis presented the floristic features of the site as a list of plant taxa that grew during the Predynastic period (El Hadidi 1982). Remains of the following species were identified: *Acacia nilotica, Ficus sycomorus, Tamarix nilotica, Sesbania sesban, Balanites aegyptiaca, Ziziphus spina-christi, Ceruana pratensis, Juncus sp., Linum usitatissimum, Desmostachya bipinnata, Phragmites australis, Hordeum vulgare, Cyperus alopecuroides, Hyphaene thebaica* and *Phoenix dactylifera*.
In a different study conducted in order to identify the past relationship between man and plants, Fahmy and Barakat (2000) analyzed a limited

sample of plant remains from Tombs 2, 3, 6 and 11. The results showed the presence of crop remains (emmer wheat: *Triticum dicoccon*, free threshing wheat: *Trirticum aestivum/durum* and flax: *Linum usitatissimum*). Wild taxa were represented by *Acacia nilotica, Ceruana pratensis, Juncus sp* and *Tamarix sp*.
During the excavation seasons of 1979, 1980, 1982, and 1985 many samples for plant macroremains analysis were gathered by. Hoffman and sent to the Cairo University Herbarium. In 2000, Prof. El Hadidi gave this botanical material to Mr. Mohamed Fadl to form part of his Ph.D. thesis research and the new information derived from the analysis of these samples has been incorporated into this report. The current study focuses on the analysis of plant macro-remains from Tombs 1, 2, 3, 5, 6, 7, 9, 10 and 11. This study reveals a fuller range of plant species selected for use in and around the tombs by the ancient inhabitants. It also sheds further light on the past relationship between man and plants at Predynastic Hierakonpolis.

Recovery and Sampling of Plant Remains

Seventy-two soil samples were collected from the nine tombs in question. The samples were dry-sieved through 2 mm mesh to separate sherds, stones, large pieces of charcoal and wood.

Identification of the plant remains

The samples were sorted into components using a stereoscopic binocular microscope (magnification: 6-100X). Each sample was divided into small portions that were examined under the binocular objective using a fine brush and needles. Desiccated and charred wood, branches, cereal chaff and fruits were segregated into plastic boxes or into glass containers (40x15mm). Desiccated wood and branch fragments were moistened in glycerol/alcohol for 24 hours. Thin free-hand or microtome sections were made for every specimen. Sections were mounted in Canada balsam or in glycerin-gel. Charred wood was examined under a reflected light bright field/dark field microscope on transverse, tangential and radial sections along fresh hand-made fractures.
Sections of desiccated or charred wood, branches, culms, and rhizome fragments were identified by comparing them with a collection of modern reference slides kept at the University of Beni Suef. References for plant anatomy were used in the identification along with drawings and photographs from archaeobotanical and anatomical studies (*cf*. Greiss 1957; Fahn 1982; Fahn *et al.* 1986; El-Hadidi & Waly 1991; Neumann *et al.* 2001).
Seeds, fruits, inflorescence and leaves were compared with modern reference collections at the Herbaria of Cairo, Helwan and Beni-Suef Universities. Drawings and photographs from floristic, taxonomic and archaeobotanical publications were also used to identify the plant remains (*cf*. Zohary 1966; 1972; Täckhlom 1974; Cope & Hosni 1991; Fahmy 1995; Boulos 1999; 2000; 2002; 2005). Nomenclature and citation for the wild species are according to Boulos (1999-2005).

Species \ Tomb	T1	T2	T3	T5	T6	T7	T9	T10	T11	Total
Number of samples	**10**	**3**	**8**	**2**	**2**	**1**	**2**	**1**	**43**	**72**
Cultivated plants										
Hordeum vulgare	-	6	-	-	1	-	5	-	2	14
Cereal culm fragments	10	-	-	-	-	-	-	-	48z	58
Linum usitatissimum	-	1	1	2	-	-	-	-	-	4
Wild herbaceous										
Ceruana pratensis	45	18	-a	-	-a	-	-	-	536	599
Juncus sp.	-	10	20	5	-	-e	3	-	-	38
Phragmites australis	-	-	14b	-	-b	-	-	-	1	15
Cyperus alopecuroides	-	-c	6c	-	-c	-	-c	-	1	7
Desmostachya/Imperata	-	-	-d	3d	-	-d	-	-	1	4
Woody plants										
Acacia nilotica	41	-	27f	-	-f	-	-	9	373	390
Ficus sycomorus	-	-	8g	-	-g	-	-g	15	278	301
Tamarix aphylla	6	-	14	-	12	-	4h	-	197	233
Tamarix nilotica	30	-	24	-	5	-	-	-	124	183
Ziziphus spina-christi	-	-	-	-	-	-	-	-	101	101
Tamarix passerinoides									14	14
Tamarix tetragyna	-	-	-	-	-	-	-	-	10	10
Balanites aegyptiaca	-	-	-j	-	-j	-	-	-	7	7
Phoenix dactylifera	-	-	-k	1	1k	1k	-	-	-	3
Salix tetrasperma	-		1		-		-	-	-	1
Morus sp.	-	-	-	-	-	-	-	-	1	1
Capparis decidua	-	-	-m	-	-	-	-	-	1	1
Fagonia bruguieri	-	-	-	-	-	-	-	-	1	1
Cupressus sempervirens	-		-		-		-	-	20	20
Pinus halepensis	-	-	-	-	-	-	-	-	5	5
Cedrus libani	-	-	-	-	-	-	-	-	4	4
Number of fragments	**132**	**35**	**115**	**11**	**19**	**1**	**12**	**24**	**1635**	**1984**
Number of species	**5**	**4**	**9**	**4**	**4**	**1**	**3**	**2**	**19**	**24n**

Table 2

Number of identified macroremains/species in tombs of HK6.
Letters designate samples identified previously and not included in the current calculations.

z. 212 fragments of emmer wheat chaff and 3 rachis internodes of T. aestivum/durum in sample from mound beside Tomb 11 (180N25E), see Fahmy & Barakat 2000: 152-3.

a. Ceruana heads identified by El Hadidi 1982, *cf.* Adams 2000 cat no. 21.

b. Identified used as arrow shafts by El Hadidi 1982; Adams 2000: cat. nos. 14, 54.

c. Used as matting, identified by El Hadidi 1982; Adams 2000 cat no. 18.

d. Used as matting, identified by El Hadidi 1982; Adams 2000 cat no. 17

e. Juncus identified with material from gut content of cattle by Fahmy & Barakat 2000: 154.

f. From boxes or biers on floor of tombs, see Adams 2000, cat no. 22; El Hadidy 1982: 108

g. Apparently in substrate frame for biers, see El Hadidy 1982; Adams 2000 cat nos. 22 and 55.

h. Carved fragment in association with textile scraps, see Adams 2000 cat no. 76.

j. Twigs as part of beir in Tomb 3, Adams 2000 cat no. 22; stone from Tomb 6 in El Hadidi 1982.

k. Used in coiled baskets in Tombs 3 and 6, Adams 2000, cat no. 16;. Spadix branches in Tomb 7 reported as impregnated with resin, see El Hadidi 1982: 108.

m. Twigs from beir or box, see Adams 2000 cat no. 22.

n. Additional species reported by El Hadidi 1982 include: Dom Palm (*Hyphaene thebiaca*) as basket fibre from Tomb 3; branchlets of Sesbania sesban from Tomb 5 and *Typha domingensis* matting and scale of *Centaurea cf depressa* from Tomb 6.

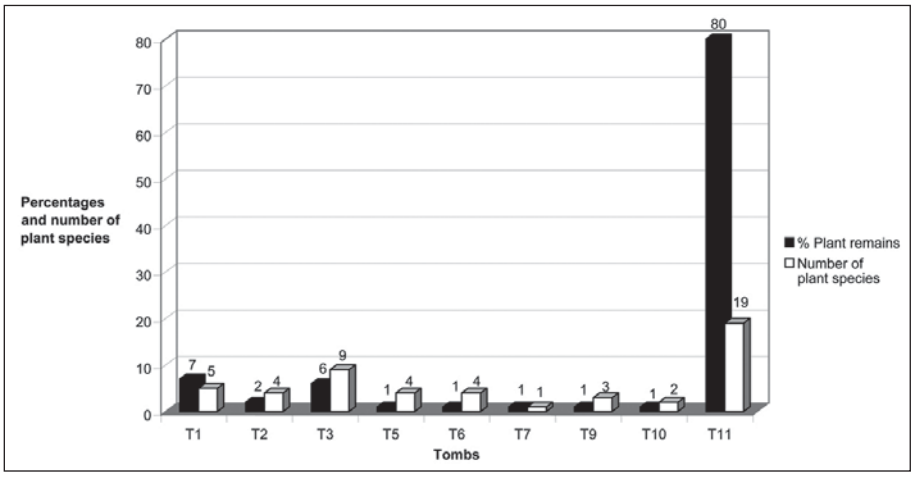

Fig. 1
Percentages of plant remains and number of plant species recorded in the tombs at HK6, Hierakonpolis.

Results

Morphological investigation revealed the presence of well-preserved plant macro-remains in and/or associated with the nine tombs at cemetery HK6. A total of 1984 plant macroremains were identified. This botanical assemblage has been attributed to 23 plant taxa (**table 2**) and classified into wild edible fruits, cultivated crops, wild herbs and grasses, wood and charcoal. The highest number and percentage of plant remains as well as the greatest number of plant species were recorded from Tombs 1, 3 and 11 (**table 2; fig. 1**). This is attributed to the relatively large number of samples collected from each of these tombs. A total of 1635 plant fragments belonged to 19 plant species were identified from the 43 samples collected from Tomb 11. In Tomb 3, 115 plant macroremains of 9 plant species were isolated from eight samples. Five species were identified from 10 samples extracted from Tomb 1. A smaller number of plant macroremains were identified from the limited samples available from Tombs 7, 9 and 10 (**fig. 1**).

Edible fruits

Stones of two edible fruit trees were recorded from in and around Tomb 11. Sidder (*Ziziphus spina-christi*) was represented by six stones, while balanos (*Balanites aegyptiaca*) was represented by two endocarps (**table 3**). A stone of *Balanites* was also identified by El Hadidi (1982:108) from the deep fill of Tomb 6. Fruits of the sidder and balanos tree were common offerings in tombs from many periods (Varatavan & Amoros 1999). Both taxa have been recorded from various Predynastic settlements and cemeteries (Täckholm 1976; Wetterstrom 1984) including Hierakonpolis (Fahmy 1995; 2003; 2005), where individual stones and a basket full of desiccated fruit of sidder were found as food offerings in the Naqada II non-elite cemetery at HK43 (see Friedman 2004b).

Quadrant / Species	T11	Mound (T11)	170N25E (T11)	180N25E (T11)	Total
Ziziphus spina-christi Desiccated stone	4	1	1	-	6
Balanites aegyptiaca *Desiccated endocarp*	-	1	-	1	2

Table 3
Numbers of identified edible fruit macroremains/ species at HK6.

Quadrant / Species	T1	T2	T3	T5	T11	mound	170N25E	180N25E	180N35E	Total
Hordeum vulgare										
Spikelet	-	1	-	-	1	-	1	-	-	**3**
Rachis internodes	-	3	-	-	1	-	2	-	-	**6**
Glumes	-	2	-	-	-	-	3	-	-	**5**
Cereal culm fragment	10	-	-	-	9	2	11	18	8	**58**
Linum usitatissimum (Textile pieces)	-	1	1	2	-	-	-	-	-	**4**

Table 4
Numbers of identified macroremains/ species of cultivated plants at HK6.

Cultivated crops

Desiccated spikelets, rachis internodes and glumes of barley were recorded from Tombs 2 and 11 (**table 4**). Culm fragments of a cereal were retrieved from Tombs 1 and 11. The presence of relatively small amounts of cereal chaff in these tombs may be attributed to the temper used in the mud-bricks that line the chamber walls. Available archaeobotanical evidence from Predynastic Adaima in Upper Egypt has demonstrated that mud mixed with different cereal was used for lining floors and walls (Willcox & Fornte1999; Newton 2004).

In an earlier study (Fahmy & Barakat 2000), over 200 desiccated remains of *Triticum diccocon* and three rachis internodes of *T. aestivum/durum* were retrieved from soil samples collected from the top level of a mound near Tomb 11.[2] It was suggested that these remains indicated threshing activities near the tomb at some undetermined point in the past; however in light of its isolated nature, this cereal chaff, if ancient, may derive from the filling of a pillow or mattress used in the tomb. Matting remains manufactured from *Juncus* as well as a leather pillow stuffed with emmer wheat chaff were recovered from the Naqada IIB Burial 92 in the non-elite cemetery at HK43 (Fahmy 2003) and more recently a grain filled pillow was found at Elephantine in a Naqada IIIc1 burial (Jones 2006). In the spoil heaps to the northeast of Tomb 11, fragments of a wooden bed frame were recovered and subsequently reconstructed (Adams 2000: cat no. 211).

Linen textile was recorded in Tombs 2, 3 and 5. Previous work identified linen textiles in Tomb 9 (Adams 2000: cat no 76) and 11 (Adams 2000: cat no. 216 with stains of copper oxide). Although only small quantities of textile were recovered from these tombs, recent excavations of the early Naqada II Tomb 25 in the HK6 cemetery have revealed substantial amounts of resin-soaked linen textile that had been used to wrap and pad the human bodies in the grave (Friedman in press). Similar pads and rolls of resin-soaked linen have been found in place around the hands, neck and head of three bodies in the contemporaneous non-elite cemetery at HK43 (Friedman *et al.* 1999: 3-11; 2002: 65-67; Jones 2007). Textiles with intricate weave patterns and copper oxide stains have also been recovered during recent excavations from several contexts in the HK6 cemetery (*cf.* Tomb 19 and Structure 07; Jones 2002) and indicate that textiles were a standard part of the grave equipment in this cemetery.

2. The grid square designation of 180N25E, located to the north of Tomb 11, given in Adams (2000: 152-3) may be in error. Although a notable concentration of botanical material was collected as Find 1-1 from that square, Find 1-3 was located in square 170N25E to the south of Tomb 11 according to the original field notes.

Species \ Tomb	T1	T2	T3	T5	T6	T7	T9	T11	mound	170N25E	180N25E	180N35E	Total
Ceruana pratensis													
Desiccated branch	30	18	-	-	-	-	-	245	5	32	47	45	422
Desiccated root	8	-	-	-	-	-	-	59	3	10	16	12	108
Desiccated head	7	-	-	-	-	-	-	18	-	11	17	46	69
Juncus sp.													
Mat	-	10	15	5	-	-	3	-	-	-	-	-	33
D. culm fragments	-	-	5	-	-	-	-	-	-	-	-	-	5
Phragmites australis (Desiccated culm)	-	-	14	-	-	-	-	1	-	-	-	-	15
Cyperus alopecuroides													
Matting	-	-	5	-	-	-	-	-	-	-	-	-	5
D. culm frag.	-	-	-	-	-	-	-	1	-	-	-	-	1
Basket piece	-	-	1	-	-	-	-	-	-	-	-	-	1
Desmostachya/Imperata (Rope of leaves)	-	-	-	3	-	-	-	1	-	-	-	-	4
Phoenix dactylifera													
Fiber fragment	-	-	-	-	-	1	-	-	-	-	-	-	1
Rope of fiber	-	-	-	1	1	-	-	-	-	-	-	-	2

Table 5
Numbers of identified culms, rhizomes, branches, roots, inflorescence and leaf macroremains /species of wild plants at HK6.

Wild species

Remains of wild grasses, rushes and herbs were recorded in nearly all of the tombs at HK6 (**table 5**). Floral heads and branches of *Ceruana pratensis* were found in Tombs 1, 2 and 11 and previous studies identified ceruana remains in Tombs 3 and 6 (El Hadidi 1982). Altogether this species represents 30% of the total assemblage of plant macroremains recorded at HK6 in this study. This plant was a common herb growing by the Nile and had a long history of use in Ancient Egypt. It was used for decorating bouquets and garlands, as fodder for animals and for making mats and baskets (Germer 1985; Keimer 1932). One of the earliest examples of its use in garlands occurs at HK43 where long floral branches of ceruana were found in situ around the neck of an intact body in this Naqada II non-elite cemetery. While such a use is certainly possible in the elite HK6 cemetery, the high frequency ceruana remains in and around tombs that have indications of superstructure is notable. Recent excavations of the architectural complexes surrounding Tomb 23 at HK6 (Naqada IIAB) have uncovered large quantities of ceruana in association with the closely spaced rows of acacia posts that make up the above-ground enclosure walls for the complexes. Branches and floral heads have been found in situ against the posts within the wall foundation trenches surrounding Tombs 23 and 24 and in Structure 07, as well as embedded beneath the gypsum plaster fallen from these walls (Friedman in press). These finds indicate that this robust plant was used as wattle in the fences and walls of this Naqada II funerary compound and suggest that it may have been used in a similar way in the post wall enclosures documented around Tombs 1 and 11 (see Adams 2000: 26-27; fig 5b, 29-32, fig 8).

Culm fragments of *Juncus sp.* were found in Tombs 2, 3, 5 and 9. *Juncus* was the dominant material for the woven mats found above and below

the nearly 500 burials in the non-elite cemetery at HK43 (Fahmy 2003; 2005). *Juncus* matting was also found in Tomb 25 at HK6, both lining the floor and surrounding the bodies (Friedman in press); however, its general rarity in the HK6 cemetery is striking and requires further study.
Culm fragments of *Phragmites australis* and *Cyperus alopecuroides* were recovered in Tombs 3 and 11. Mat fragments of Cyperus alopecuroides were previously identified in Tombs 2, 6 and 9 and arrow shafts of Phragmites were noted from Tombs 3 and 6 (El Hadidi 1982). Both species were used for making mats and baskets in Ancient Egypt (Greiss 1957). Remains of rope made of the leaves of halfa grass (*Desmostachya/Imperata*) were separated from samples collected from Tombs 5 and 11. Matting made from the same material has also been identified from Tombs 3, 5 and 7 (El Hadidi 1982). Ropes made from the fibers of date palms (*Phoenix dactylifera*) were recorded from Tombs 5, 6 and 7 (**table 3**) and basket fragments of the same material are known from Tomb 3 (Adams 2000: cat. no. 16).

Woody Plants

Charred and desiccated fragments of the wood of nine native trees and shrubs as well as four introduced taxa were retrieved from Tombs 1, 3, 6, 9, 10 and 11 (**table 6**). Desiccated and charred wood fragments of *Acacia nilotica* were retrieved from Tombs 1, 3, 10 and 11. Wood and charcoal of this tree represented about 20% of the total amount of plant remains recorded in the samples from HK6 used in this study. In Predynastic Hierakonpolis, *Acacia nilotica* was a very important source of fuel and it was also used in the fences found in domestic contexts at various localities around the site and in funerary contexts at HK6 (Fahmy 2003; 2005). The examined parts of the bed recovered from in and around Tomb 11 were also constructed from acacia (Adams 2000: cat. no. 211)
Desiccated and charred wood fragments of *Ficus sycomorus* were separated from Tombs 3, 10 and 11. Together they represent about 15% of the total plant macro-remains in this study. This type of wood is described as soft and was often used to make wooden coffins in later periods (Germer 1985; Murray 2000). Pieces described as fragments of funerary biers found on or near the floors of Tombs 3, 6 and 9 have also been identified as ficus (Adams 2000: cat nos. 22 and 55; El Hadidi 1982). Wood fragments of *Tamarix aphylla, T. nilotica* and *Ziziphus spina-christi* were retrieved from Tombs 3, 6, 9 and 11. Limited remains of *Capparis decidua*, and *Fagonia bruguieri* were isolated from Tomb 11 and only small fragments of Capparis were identified from the fill of Tomb 3 (Adams 2000: cat no. 22), suggesting the rarity of their occurrence in this region.
Overall, this study shows that the natural vegetation around the site was rich and dominated by native trees of *Acacia nilotica, Balanites aegyptiaca, Ficus sycomorus, Tamarix aphylla, T. nilotica, T. passerinoides T. tetragyna*, and *Ziziphus spina-christi.* A few wood fragments from exotic species of *Cedrus libani, Cupressus sempervirens,* and *Pinus halepensis* were retrieved from Tomb 11 only. These foreign woods may originate from boxes, for which numerous fragments and inlays were found (Adams 2000: cat 113, 114, 208, 209), but this usage remains unverified.

Species \ Tomb	T1	T3	T6	T9	T10	T11	mound	170N25E	180N25E	180N35E	Total
Acacia nilotica											
Wood (D)	41	27	-	-	9	142	11	37	40	42	349
Charcoal	-	-	-	-	-	21	-	9	8	3	41
Ficus sycomorus											
Wood (D)	-	8	-	-	15	61	27	29	33	34	207
Charcoal	-	-	-	-	-	52	-	10	24	8	94
Tamarix aphylla											
Wood (D)	6	14	12	4	-	86	-	13	29	9	173
Charcoal	-	-	-	-	-	46	-	5	9	-	60
Tamarix nilotica											
Wood (D)	36	24	5	-	-	33	10	6	17	23	154
Charcoal	-	-	-	-	-	-	-	-	-	5	5
Ziziphus spina-christi											
Wood (D)	-	-	-	-	-	79	1	5	-	-	85
Charcoal	-	-	-	-	-	8	-	2	-	-	10
Cupressus sempervirens Wood (D)	-	-	-	-	-	20	-	-	-	-	20
Tamarix passernoides											
Desiccated wood	-	-	-	-	-	4	-	-	-	-	4
Charcoal	-	-	-	-	-	10	-	-	-	-	10
Tamarix tetragyna											
Wood (D)	-	-	-	-	-	5	-	-	-	-	5
Charcoal	-	-	-	-	-	5	-	-	-	-	5
Balanites aegyptiaca	-	-	-	-	-	5	-	-	-	-	5
Charcoal											
Wood (D)	-	-	-	-	-	2	-	2	-	1	5
Cedrus libani (D. wood)	-	-	-	-	-	4	-	-	-	-	4
Wood (D)	-	1	-	-	-	-	-	-	-	-	1
Morus sp. (D. wood)	-	-	-	-	-	-	-	-	-	1	1
Capparis decidua Branch (D)	-	-	-	-	-	-	-	-	1	-	1
Fagonia bruguieri Branch (D)	-	-	-	-	-	1	-	-	-	-	1

Table 6

Numbers of identified wood and branch macroremains/ species at HK6.

Discussion

Previous archaeobotanical studies of Predynastic domestic assemblages and that from the non-elite cemetery at locality HK43 in Hierakonpolis (Fahmy 1995; 2003) have shown that the economy of the site was based mainly on cultivation of cereals like emmer wheat (*Triticum dicoccon*) and barley (*Hordeum vulgare*) as well as free threshing barley (*Hordeum vulgare* var *nudum*) and wheat (*Triticum durum/aestivum*) (Fahmy & Fadl 2006). In the elite cemetery at HK6, this study recorded only a small amount of barley (*Hordeum vulgare*),

while Fahmy & Barakat (2000) reported the presence of an isolated cluster of emmer wheat remains from around Tomb 11. Variation in the cereal assemblages within the two cemeteries requires clarification, but may be due in part to different preservation conditions. Overall, the organic preservation at HK43 was far better and the burials were less disturbed. In addition, the sandy pit graves at HK43 were often filled with a dark gray, often organics rich, sediment, which may have been transported from the family hearth or living area (*cf.* Midant-Reynes 1997: 207). Similar material was also found in several of the ceramic vessels, often in conjunction with remains of bread and other cereal remains. Actual and virtual food stuffs were also found with some frequency in the HK43 cemetery along with the preserved contents of the digestive tract of the tomb owners (Fahmy 2001; 2003; 2005; Friedman *et al.* 1999; 2002). This level of preservation has not been observed thus far at HK6.
Edible wild fruits of Balanites aegyptiaca and Ziziphus spina-christi were gathered by inhabitants of the site and deposited as offerings in elite and non-elite graves. From Predynastic times onward, both fruits were much appreciated and are often recorded among the food offerings in Dynastic tombs (Vartavan & Amoros 1997).
In cemetery HK6, culm remains of *Juncus* sp and *Cyperus alopecuroides* were recovered. Both taxa were used in ancient Egypt for matting and basketry (Greiss 1957). Culms of Juncus were woven together to produce the mats in which the human bodies were wrapped at HK43 (Fahmy 2003), but this appears to a far lesser extent in the elite cemetery at HK6. The genus Juncus includes nine species in the flora of Egypt (Boulos 2005). These plants grow in marshy places, often in shallow brackish semi-saline soil. Other wild grasses, sedges and rushes used in the HK6 cemetery are also water loving plants and *Ceruana pratensis* and *Phragmites. Ceruana pratensis* grows on the muddy terraces of the Nile and form stands on its banks and canals (Zaharan & Willis 1992) and Phragmites was common in swampy habitats throughout the Nile Valley (Boulos 2005).

The current study suggests the characteristic habitats and plant communities that flourished near the site are as follows:
1. Contracted desert vegetation widespread on both sides of the Wadi Abu Suffian. The plant assemblage of this habitat included: *Acacia nilotica, Balanites aegyptiaca, Capparis decidua, Fagonia bruguieri, Ficus sycomorus* and *Tamarix aphylla.*
2. Contracted ground water-bound desert vegetation dominated by *Acacia nilotica*, *Desmostachya/Imperata* and *Tamarix.*
3. Swampy habitats including stands of *Phragmites, Desmostachya/Imperata, Cyperus alopecuroides* and *Tamarix nilotica*

Available archaeobotanical records from the HK6 cemetery and other localities at Predynastic Hierakonpolis show that the ancient inhabitants of the area gathered their plant requirements from the surrounding habitats along the Nile and the wadis of Abu Suffian and El Khamasini (Fahmy 2003). The current study shows that they depended heavily for both wood and fuel on native trees such as *Acacia nilotica, Ficus sycomorus Tamarix aphylla Tamarix nilotica* and *Ziziphus spina-christ.*
Fragments of introduced wood were found in Tomb 11 only and have been attributed to the following conifer trees: *Cedrus libani, Cupressus sempervirens, Pinus halepensis*. These genera are not native to the flora of Egypt and there is no clear evidence in the archaeobotanical literature to suggest that these

taxa were grown in Ancient Egypt. They could have been imported from the Levant. This would explain the rarity of conifer wood within our samples. These findings in addition to the varied and rich assemblage of artifacts recovered from tomb 11 further indicate the high status of the child interred therein (Adams 2000).

Conclusion

This study sheds light on the past relationship between the Predynastic inhabitants of Hierakonpolis and the surrounding natural vegetation. The inhabitants depended on collecting wild fruits such as *Balanites aegyptiaca* and *Ziziphus spina-christi* as supplements to a diet based on cultivated cereals crops. The small amount of emmer wheat and barley recorded in this study alone does not give an accurate picture of cereal cultivation in Predynastic Hierakonpolis. However, previous studies of non-elite cemetery and domestic contexts (Fahmy 2003; 2004) have shown that cereals (including emmer wheat, hulled barley, free threshing wheat and barley) were intensively cultivated at the site. Subsistence therefore was based on the cultivation of cereal crops, especially emmer wheat, herding of livestock and the collection of tubers and fruits from of wild plant species like *Balanites aegyptiaca, Cyperus esculentus, Ziziphus spina-christi.*

The inhabitants exploited intensively the arboreal vegetation which appears to have existed in accessible stands around the site. Native trees of *Acacia nilotica, Tamarix spp* and *Ziziphus spina-christi* were major sources of wood and fuel. Available archaeobotanical evidence suggests that moister climatic conditions prevailed in the area of Hierakonpolis during the Predynastic period. Butzer (1959) concluded that the desert area between Esna and Idfu, west of the Nile received a mean annual rainfall c. 50-100 mm/year during the period between 5000-3000 BC. This amount of precipitation was quite enough to support the growth of the reconstructed plant cover. The natural plant cover in the Wadi Abu Suffian depended on surface and underground water. The prevailing moister conditions may have provided a favorable habitat for the growth of pasture plants, stimulating the herding of goat or sheep.

The natural plant cover around the site has been reconstructed and three distinct vegetation layers have been distinguished: 1) a tree layer included *Acacia nilotica, Balanites aegyptiaca, Ficus sp, Tamarix sp* and *Ziziphus spina christi;* 2) a shrub and woody perennial layer which included *Fagonia bruguieri, Capparis decidua, Phragmites australis*; 3) a swampy layer which included *Juncus* sp, *Cyperus alopecuroides* and *Desmostachya* sp. These taxa still grow in many locations across the Western Desert of Egypt and are the main components of the contracted vegetation, which characterises the southern part of the desert west of the Nile (Zahran & Willis 1992).

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