International Research Journal of Biological Sciences _____E-ISSN 2278-3202
Vol. **5(9),** 22-31, September **(2016)** *Int. Res. J. Biological Sci.*

Plant Remains from the Holocene of Sheikh El-Obeiyid Area (Farafra Oasis, Egypt), 7730-5360 b.p.

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Available online at: www.isca.in, www.isca.me
Received 29th August 2016, revised 3rd September 2016, accepted 6th September 2016

Abstract

Egypt is a hyperarid region of the Eastern Sahara of Africa, the oases of the Western Desert form green patches. In the Holocene of Farafra Oasis (7730-5360b.p.) humid climate with dense vegetation and herding animals were recorded. Archaeobotanical and Archaeological evidences of the Sheikh El-Obeiyid area in the westnorth of Farafra Oasis, three active occupation periods in Sheikh El-Obeiyid Neolithic site were identified, the first period extended from 7530–6166 b.p. in El-Bahr Playa, and the second period extended from 6320–6170 b.p. in Valley 1 and Bir El-Obeiyid Playa and the third period from 5790–5360 b.p. in Valley 1 and Valley 3. Identified plant species indicated a moist conditions of small lakes with their surrounding Tamarix nilotica, Juncus sp., Cyperus sp, and Samolus valerandii; in the Wadi El-Obeiyid and its tributaries Acacia, Tamarix aphylla and Ficus trees forms a desert savanna vegetation. The recorded types of vegetation proved that there are obvious effects of monsoon summer and Mediterranean winter climate on the vegetation of the Holocene in Sheikh El-Obeiyid area. There is a similarity of archaeological features between the Sheikh El-Obeiyid and the nearby Hidden Valley basin, both of them were active in the seventh millennium b.p.

Keywords:

Introduction

The Western Desert of Egypt is a part of the Eastern Sahara; it locates west of the Nile Valley and represents about 66% of country area. Climate varies from semiarid at the Mediterranean coast to hyperarid in the south[1]. Wadis are not found or ill defined compared with of the Eastern Desert[1]. Furthermore, the hyperarid climate, made the land surface homogenous with weak topographic. In fact, oases are shelter for plants and animals of the West Desert. The Egyptian oases (Siwa, Bahariya, Farafra, Dakhla and Kharga) has much amount of stored water basin from the prehistory. Wells are the major source of water for cultivations [2]. Many weeds in cultivations of the oases are similar to that grow in the Nile Valley.

Holocene episode refers to the postglacial period of geological time, about c. 10,000 p.b. years ago; together with the previous two million years of the Pleistocene epoch, it comprises the Quaternary era[3]. The upper Pleistocene of the Western Desert of Egypt was a hyperarid period. About 10,000 years b.p. wet climatic conditions prevailed and the Holocene period with gathering and hunting began. The oases (Farafra, Baharia and Dakhla) were ideal sites to elaborate this phase. In this time, the area has two wet seasons, the summer tropical monsoon and the winter wet Mediterranean[4,5]. Water availability throughout the year favoured gathering of wild plants and herding domestic animals, and encouraged the beginning of semi-sedentary societies[6,7]. Farafra in the middle Holocene (7200-6000 b.p.) had successive occupation phases around the historic water bodies (Bahr Playa, Hidden Valley Playa and Sheikh El-Obeiyid playas), large hearths, pits and pot-holes and limestone-lined huts were used by successive generations[7]. The occupation model of foragers-herders contexts, which initiated in the previously mentioned oases, seems to be the beginning of Neolithisation phase[8]. The dwellings with several rows of stone slabs, in the Farafra and Dakhla oases[9] indicate the presence of a permanent population around the playas of the Middle Holocene in the Western Desert in Egypt. Previous studies of other adjacent Neolithic sites showed that, 30 plant species were recorded studied features the Hidden Valley, and showed a dominance of *Sorghum*[10]; charcoals of the *Acacia, Tamarix, Maerua crassifolia* and *Capparis*, also fruits of *Zilla spinosa, Anastatica hierochuntica* and *Gramineae* were recorded from the Holocene of Djara[11]. The present study aims to reconstruct the vegetation of Sheikh El-Obeiyid area at Holocene (7730-5360 b.p.), to recognize the economic activities of human populations and to elaborate the climate of the studied area at Holocene.

Study area: Wadi El-Obeiyid was a large occupation with elaborated dwellings, is located 20km west of the Hidden Valley on the north eadge of the Farafra Plateau. Our studied area is subdivided to three features (Figures 1, 2): the plateau, the main scarp and the depressions (Bahr Playa and Bir El-Obeiyid Playa). The hill of the Sheikh El- Obeiyid is 80m high, and is 235m asl at its highest point.

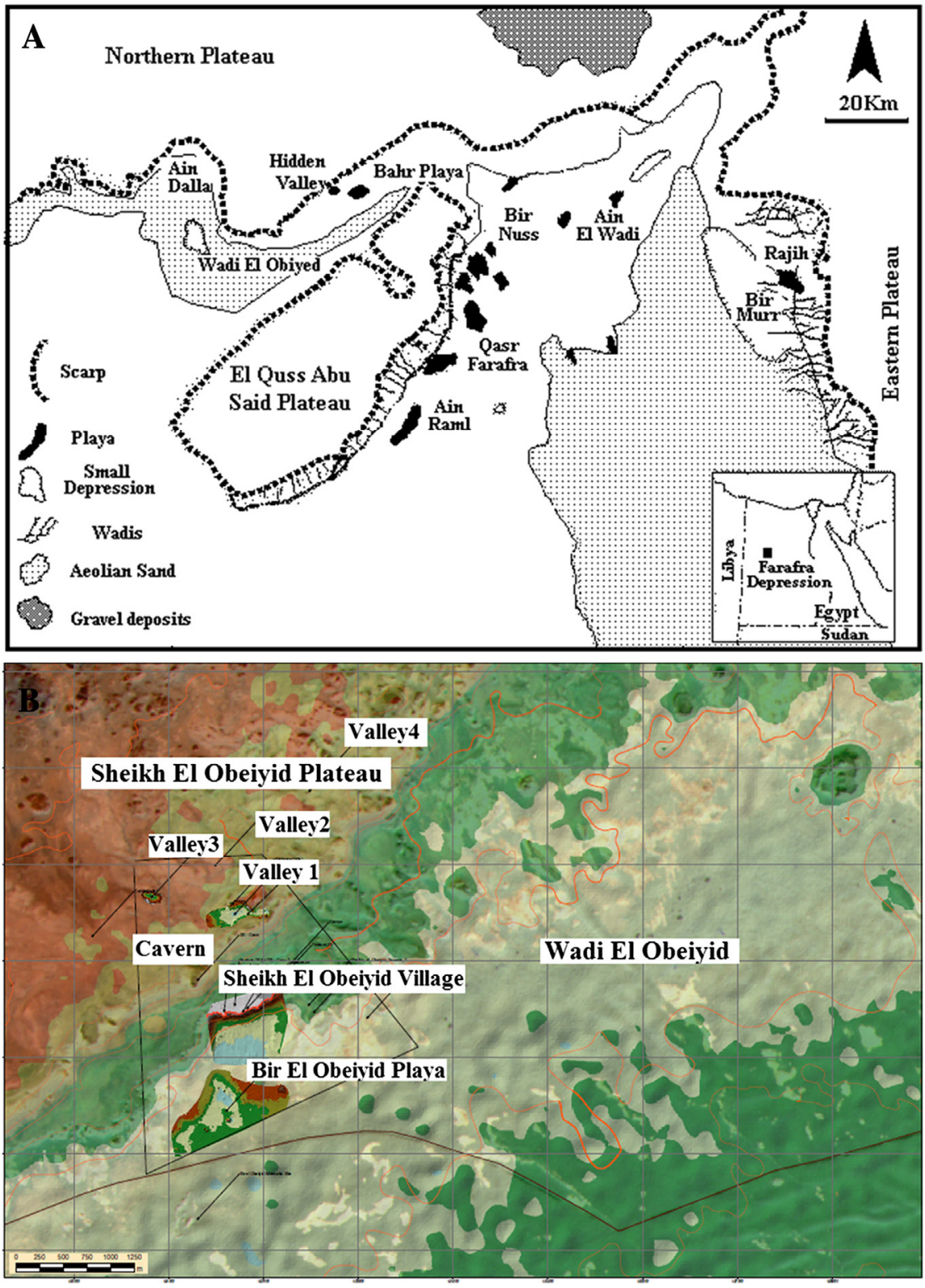

Figure-1

(A) A location map of the studied features of Sheikh El-Obeiyid site; (B) Geographic illustration showing the components of the historic Wadi El-Obeiyid site[12]

The part of the depression is the bed of the Wadi El-Obeiyid which is 70-90m asl. Sheikh El-Obeiyid area have three generations of playa lake sediments, which are found at different elevations and date back to the Early to Middle Holocene[7,12]. The ancient playa (Middle Stone Age artifacts) with sediments of a slight cover of calcareous sands, together with shore and near shore gravel, intercalated with immense grey silt demonstrating deep water environment[7]. The two younger playas, one lied on the northern part of the basin at an elevation of up to 83m asl, and date to the Early Holocene occupation. The other playa located on the central area of the basin, at an elevation of 70m asl, and could be related to the Middle Holocene occupation[7]. Valley 1 is located on the third erosion level; it is carefully investigated in season 2006. A preliminary survey also looked at valleys 3 and Bir El-Obeiyid playa. Numerous hearths, stone tools, grinding stones, ostrich egg shell sherds and few ceramic fragments were found everywhere, A complex of 29 structures contained sediments with ash and charcoal, which proved function as dwellings[7,12].

Valley 1: The valley is a shallow depression, covering an area of about 80000m^2, delimited towards the north and north-east by a ridge 8m high. The 120 hearths recorded all over the valley are of the Steinplatz-type[13,14]. Eight hearths were excavated and sampled in the section area. The hearths were purposely chosen for excavation to represent different conservation states. Only a few charcoal patches were recorded under the flat stone scatters, therefore confirming that these represent the final deflation stage of a Steinplatz. Another test excavation targeted an oval-shaped structure (Feature-1) located at the eastern end of the valley, consisting in a heap of limestone slabs covering a sequence of two distinct hearths. Radiocarbon dates (Table-1) point to the presence of at least three occupation phases, which have been partially confirmed by the lithic artifacts1: an Early Holocene cultural horizon and two Middle Holocene horizons included bifacial knives, gouges and tools with foliated retouch[7].

Bir el Obeiyid playa: At the lowest point of the Wadi el Obeiyid, lies Bir El-Obeiyid playa at about 80-70m asl. It has an elongated shape that is 3 km long and about 1km wide, and is characterized by fair to small yardang formations. Many hearths and with rich stone assemblages dating to the Holocene were identified in this area[7]. Eight hearths were excavated on the northern and eastern edges of the basin and one in the south-western one. All the hearths were characterized by burnt stones scattered on the surface aeolian sand, forming a small sub-circular or oval mound with a diameter of 0.5-4.0m. Under the superficial sandy layer[7].

Bahr Playa: Bahr playa located in the east north side of Wadi El-Obeiyid, its deposits and geologic features were carefully described and the periods when the region was inhabited are elaborated as indicated by organic and mineral deposits as charred remains, different types of minerals and ostrich eggshell, the period of occupation ranged from 7725±60 to 6050±75 yr[15].

Geological settings of the study area: The exposed bedrock of our studied area is made up of the Upper Cretaceous /Lower Eocene succession, which is dominant in the Farafra Oasis. The succession is dominated by chalk, limestone, dolostone, shale, mudstone and sandstone. Around the Shakh El-Obeiyid hill, the erosion surface of the main plateau scarp contains a number of small communicating piedmont basins, called valley (Figure-2). In the past these valleys were filled by temporary water when it rained, thereby attracting people and animals[7].

Finally, a small karstic cave, located on the slope between the second and the third erosion surfaces and looking onto the Bir El-Obeiyid. The anthropic deposit of the cave yielded a quite rich ethnographic complex of pottery sherds, wooden tools and containers in leather and pumpkin. Several stone tools were also found which testify to the use of the cave from at least the Middle Holocene[7].

Materials and Methods

Soil samples (22 samples, were collected by Prof. Barbara Barich and Dr. Julio Lucarini in 2006, University Rome, La Sapienza) were retrieved from four sites in Farafra oases (Al Bahr Playa, Shakh El-Obeiyid, Bir El-Obeiyid Playa and Hidden Valley). Sherds, stones were discarded from small materials using wide pores mesh. The components were separated in small bottles using low magnification stereoscopic binocular.

Charred wood fragments were examined under reflected light bright field/dark field microscope on transverse, tangential and radial sections. Sections of desiccated or charred wood, branches and culms fragments were identified by comparing them with a collection of modern reference slides kept at Beni-Suef University herbarium. References of plant anatomy were used in the identification along with drawings and photographs from archaeobotanical and anatomical studies[16-19]. Fruits, seeds and leaves are compared with modern reference collection at the Herbaria of Cairo and Beni-Suef University (BNSU). Drawings and photographs from floristic and archaeobotanical publications were used to identify the plant remains under study[19-23]. About 11 dating are now available and reveal a long period of occupation during the Holocene of the area (Table-1).

Results and Discussion

Plant remains (charred, desiccated wood and branches, charred, desiccated seeds, fruits and desiccated leaves) were extracted from 15 soil samples belong to three archaeological sites (Al Bahr Playa, Shakh El-Obeiyid and Bir El-Obeiyid Playa). The identified remains were attributed to nine taxa (Table-2); Bir El-Obeiyid and Valley 1 sites included five taxa (55.6% of the recorded species each), followed by Al Bahr Playa and Valley 3 sites which included one taxon each (11.1% of the recorded species). Charred wood of *Tamarix* and *Acacia* trees was common, seeds of *Samolus valerandii* were identified in many samples (Table-2).

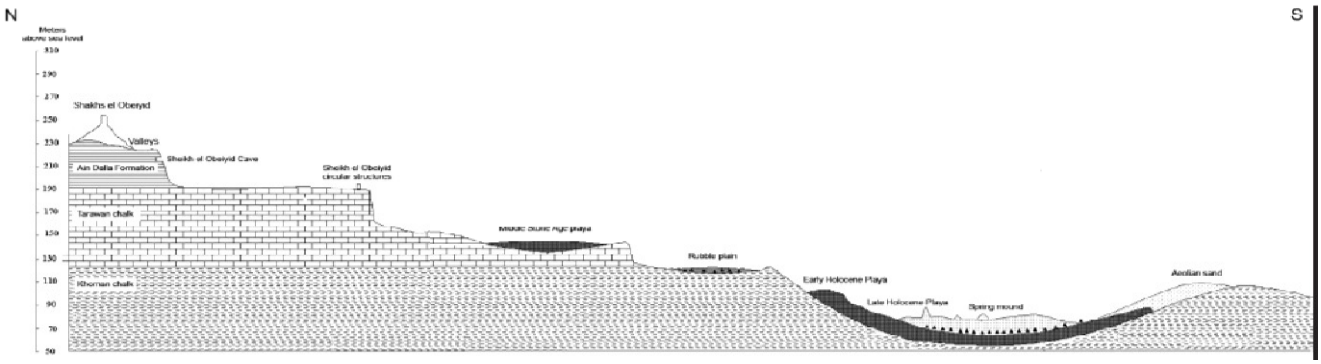

Figure-2
Sheikh/Bir el Obeiyid (Farafra Oasis). Geological cross section of the areas showing the main geomorphological units and the archaeological evidences[7]

Table-1
Dating of the studied sites[7,15]

Area	Feature	Lab. number	Material	14C Age [bp]	Calibrated [BC-AD]
Sheikh el Obeiyid Valley1	h_06_07 (hearth)	Gd-11991	Charred	6280±40	5730 - 5620 BC
Sheikh el Obeiyid Valley1	h_06_08 (hearth)	GdS-561	Charred	6320±60	5472 - 5206 BC
Sheikh el Obeiyid Valley1	h_06_09 (hearth)	Gd-19103	Charred	5600±90	4624 - 4322 BC
Sheikh el Obeiyid Valley1	h_06_24 (hearth)	GdA-1193	Charred	6260±40	5320 - 5205 BC
Sheikh el Obeiyid Valley1	Feature 1 Layer 1 Sector 9 D IV hearth 1	GdS-560	Charred	5360±60	4332 - 4047 BC
Sheikh el Obeiyid Valley1	Feature 1 Layer 1 Sector 9 D IV f hearth 2	GdA-1188	Charred	6300±40	5365 - 5212 BC
Sheikh el Obeiyid Valley 3	h_06_133 (hearth)	GdS-559	Charred	5790±50	4778 - 4521 BC
Bir el Obeiyid Playa	Hearth 1 a2, a3, b3	GdA-1191	Charred	6170±35	5218 - 5011 BC
El Bahr	h_4g (hearth)		Charred	6166±100	
El Bahr	h_4f (hearth)		Charred	6550±75	
El Bahr	h_05_2 (hearth)		Charred	7730±60	

Acacia sp. Mill: *Acacia* is a thorny tree, represented by 10 species in Egypt[20]. Vessels are diffuse; with ill growth ring, vessels rounded in outline, large, few per square mm, solitary, in radial multiple of 2-3 or in clusters of 2-5. Perforation plates simple; intervessel pits alternate, vestured. Fibres medium thick to thick-walled, with simple to minutely bordered pits restricted to the radial walls. Axile parenchyma, paratracheal vasicentric-aliform-confluent, with single crystalliferous cells. Rays, 5-8/mm; 1-7 cell wide, up to 1mm high; homocellular with long procumbent cells. Charred and desiccated wood of *Acacia* was recorded from from Nabta playa and Djara Playa (Neolithic)[11,24]. Also charred and desiccated wood of *Acacia* was identified from Predynastic Hierakonpolis[19].

Chenopodiaceae: This family includes 20 genera in Egypt[20]. Most genera are halophytes or xerophytes with jointed stem and succulent or scaly leaves. Three leaves were attributed to family *Chenopodiaceae* were identified. The studied leaves are ovate-orbicular, 1.5-2mm long, 1-1.3mm wide. Charcoal of *Chenopodiaceae* type was recorded from Djara Playa (Neolithic) [11].

Cyperus cf. *rotundus* L.: Perennial sedge, with rhizomes; culm trigonus, 15-130 cm long and 0.1-0.4 cm thick; spikelets flat, with 2-ranked glumes, in spicate or umbel inflorescence1-6cm long, up to 40-flowered. Nut trigonous, ellipsoid-oblong, with flat faces and sharp angles, minutely apiculate, 1.1-1.8 x 0.7-0.9

mm. Nutlets of *Cyperus* cf. *rotundus* were recorded from Predynastic Hierakonpolis[19]; from Nabta playa (Neolithic) [24].

Ficus sp. L.: *Ficus sycomorus* and *Ficus carica* are large, robust trees in the countryside, with fruits (figs) sweet juicy and edible, there are another two species grow in the mountains of Egypt, *F. palmata* and *F. cordata*. Growth rings absent (or very faint); vessels diffuse, 3-7/mm^2, in radial multiples of 2-3 (6), sometimes in clusters, rarely solitary, rounded in cross-section, tangential diameter 90-240 µm, radial diameter up to 300 µm; vessel members are 490 (320-680) µm long; many vessels with tyloses. Parenchyma in wide (6-20 seriate) tangential bands alternating with fibres bands. Fibres are 1,450 (910-1,920) µm long, medium thick to thick-walled. Rays 3-5/mm^2, of two sizes 1-4 seriate (up to 14 cells high), 5-14 seriate (up to 1.4mm high). Lacticiferous ducts may be observed in rays. Fruit of fig were retrieved from Hidden Valley (Neolithic)[25]. Wood of fig was recorded from Hierakonpolis (Predynastic) 19, from Tutankhamun tomb (Dynastic, 1323 B.C.)[26].

Juncus sp. L.: *Juncus* is represented by nine species in Egypt. Rush salt marsh plant, usually with sympodial rhizome, developing one leafy shoot every year. Culm unbranched, striated, solid. Leaves cylindrical or grooved. Culms are of ridges and furrows, below the ridges are found inverted conical patches of thick-walled lignified fibres and below the furrows there are strips of palisade-like cells. The ground of cortex and pith. Small and large vascular bundles are scattered in the cortical region. The large are surrounded each by two bundle sheaths: an inner sheath of lignified fibres and an outer sheath of a ring of parenchyma cells, the inner sheath is well developed on both sides of the bundle. Culm fragments of *Juncus sp.* were identified from Hidden Valley (Neolithic) [25], from Predynastic Hierakonpolis[27].

Samolus valerandii L.: Small to large herb, up to 60 cm high, leafy, glabrous, few branched, perennial. Seeds irregular polyhedral, trigonal, dorsal side convex, two ventral sides flat, 0.5-0.6 x 0.3-0.4 mm. Surface nearly smooth, dull, reddish-brown. Cosmopolitan, in wet, marshy chalky habitats. Desiccated seed of *Samolus valerandii* were identified from three samples in valley 1. It the first time to record *Samolus valerandii* in the historical flora of Egypt.

Tamarix nilotica (Ehrenb.) Bunge : Small tree up to 5m high; bark reddish-brown. Leaves scale-like, 1-3 mm long, ovate-deltoid. It has a wide ecological amplitude. Young branches are grazed by cattle. Growth rings distinct. Wood ring- to semi-ring porous, with almost solitary rounded vessels i, 11-26/mm^2; vessels may be in multiples of 2(4) and clusters of 3-4; 20-160 µm diameter; vessel members storied together with parenchyma cells; vessel members are 80-130 µm long.

Fibres are 350-750 µm long. Parenchyma vasicentric. Rays 2-4/mm, (3) 6-10-seriate, up to 1mm high or more. Wood of Nile tamarisk was recorded from from Nabta playa (Neolithic)[24]. Also, from Predynastic and Dynastic of ancient Egypt[19,28,29].

Tamarix aphylla (L.) H. Krast: Tree up to 12m high with a stout trunk; with green branchlets, joined, carrying rudimentary leaves, it grows in wadi beds with deep dampy soil. Growth rings faint to distinct. Wood diffuse to semi-ring porous, rounded in cross-section, 6-15 (40)/mm2; mostly solitary, sometimes in multiples of 2 (4), and clusters of 3-4, diameter 25-280 µm; vessel members are 120 (90-140) µm long; vessel members storied together with parenchyma cells. Fibres are 300-780 µm long. Parenchyma vasicentric. Rays 2-3/mm, 5-23-seriate, up to 1.5 (2.5) mm high. Wood and leaves of athel tamarisk were recorded from Neolithic, Predynastic and Dynastic of ancient Egypt[19,24-26,29].

Three branch fragments with very developed air chambers and very reduced vascular tissue were identified from hearth 8 (valley 1).

Discussion: Oases with their adequate underground water offered ideal habitats for plants, animals and man in the Western Desert of Egypt from prehistory till now. On the basis of archaeological and archaeobotanical evidences obtained from the Sheikh El-Obeiyid area, we can conclude that, human occupation of the northern Farafra depression extended for extensive periods of the Holocene, going back as far as the Pleistocene. This can be attributed to the favourable environmental conditions (warm climate, heavy rains and vegetation of large trees) and the general low topography of the oasis. Sporadic and ephemeral presence of hunters in the oasis area in the Early Holocene date back to the tenth millennium b.p.[7]. Occupation was developed during the seventh millennium, with the appearance of many active playas and the largest settlement clusters. On the other hand the contemporary presence of more movable structures (hearths, concentrated surface scatters of artifacts) gathered in Valley 1 and in the Bir El-Obeiyid playa show that along with the more established component was a more mobile element, probably pastoral[7]. This phase saw the emergence of high-quality stone tools which indicate the existence of practiced crafts people, related utensils with similar dates actuality found in the Fayum (6500 b.p.); the same tools appear later in the Badari centres and then Naqada[30].

1-Economic activity of Sheikh El-Obeiyid compared with Hidden Valley: Remains of grasses and palatable herbs were very rare in Sheikh El-Obeiyid archaeological site compared with the Hidden Valley site. The economy of the later site was based on wild grasses and herbs exploitation. Also, prehistoric man in our studied localities might exploited fruits of *Ficus sp*., leaves of *Samolus valerandii*, fruits and rhizomes of *Cyperus* sp. Remains of 30 plant species were retrieved from the Hidden Valley, and showed a broad prevalence of *Sorghum* and the presence of many other edible grasses[10,31-33]. Animal herded leaves of *Cyperus* and *Tamarix nilotica,* also other herbs and grasses. Culms of *Juncus* were used to cover roofs.

Table-2
Identified palaeobotanical plant remains retrieved from the studied sites in Farafra Oasis.

SITE	Feature	Lab. No.	Depth (cm)	Status	Identified plant species
SK-OB Valley 1	h_06_02 (hearth)	-	5	Desiccated	One desiccated seed (*Samolus valerandii*)
SK-OB Valley 1	h_06_07 (hearth)	Gd-11991	5	Charred	∞ very small charred wood frags. (?) One desiccated seed (*Samolus valerandii*)
SK-OB Valley 1	h_06_08 (hearth)	GdS-561	6	Charred	∞ very small charred wood frags. (?) 5 desiccated branchlets with wide air chambers (hydrophyte)
SK-OB Valley 1	h_06_08 (hearth)	GdS-561	15	Charred	∞ very small charred wood frags. (?)
SK-OB Valley 1	h_06_08 (hearth)	GdS-561	15	Charred	Light soil with very small fragile charred wood fragments (?).
SK-OB Valley 1	h_06_09 (hearth)	Gd-19103	7-10	Charred	∞ very small charred wood frags. (?) Desiccated branchlet (*Tamarix nilotica*)
SK-OB Valley 1	h_06_24 (hearth)	GdA-1193	10	Charred	Light organic matter
SK-OB Valley 1	Feature 1 Layer 1 Sector 9 D IV hearth 1	GdS-560	4	Charred	Very light soil with insect remains. 15 small charred wood fragments (*Acacia*).
SK-OB Valley 1	Feature 1 Layer 1 Sector 9D IV h1	GdS-560	13	Desiccated	25 desiccated seeds (*Samolus valerandii*)
SK-OB Valley 1	Feature 1 Layer 1 h 1		4	Charred	Light organic matter
SK-OB Valley 1	Feature 1 Layer 1 Sector 9 D IV f hearth 2	GdA-1188	15-20	Charred	∞ very small charred wood frags. (?) 6 small chared wood fragments (*Ficus*)
SK-OB Valley 1	Feature 1 Layer 1 Sector 9 D IV f hearth 2	GdA-1188	4	Desiccated	2 very small charred wood frags. (?) Very small desiccated culm(?)
SK-OB Valley 1	Pottery	-	0	Charred	Light organic matter
SK-OB Valley 1	Ash 1	-	5	Charred	Light organic matter
SK-OB Valley 3	h_06_133 (hearth)	GdS-559	5	Charred	6 small chared wood fragments (*Tamarix*)
BR-OBEIYD	Hearth 1 a2, a3, b3	GdA-1191	8	Charred	∞ small charred wood frags. (*Acacia*). Charred nutlet (*Cyperus* cf. *rotundus*). Desiccated branchlet (*Tamarix nilotica*) 3 desiccated culm fragments (*Juncus*). 3 desiccate leaf parts (*Chenopodiaceae*)
El Bahr	h_05_2 (hearth)	-	2	Charred	5 very small charred wood frags. (?)
El Bahr	h_05_2 (hearth)	-	2	Charred	Charred organic matter with very small fragile charred wood fragments (?).
El Bahr	h_4g (hearth)	-	5	Charred	∞ very small charred wood frags. (?) Desiccated branchlet (*Tamarix aphylla*)
El Bahr	h_4f (hearth)	-	10	Charred	7 charred wood fragments (*Tamarix*)
El Bahr	h_4f (hearth)	-	10	Charred	7 charred wood fragments (*Tamarix*)
HV 06	h_1 (hearth)	-	6	Desiccated	Light organic matter

Hydrophyte (indet.)

The presence of four carbonized bifacial knives that were found within the playa deposit that formed the hearth base. Cortex remains on both surfaces of some knives confirmed the use of these tools wood-working or cutting of bushes or grasses that grew around the numerous basins along the course of the Wadi El-Obeiyid[34]. The overall distribution of the Steinplätze (in valley 1), the C14 dates and the spatial analysis of the artifacts suggest a pattern of mobile and periodic exploitation of the valley by small groups. Despite, no faunal and few botanical remains have been found, a broad range of subsistence activities can be imagined: hunting, gathering and mainly herding[7]. Furthermore since the marshy habitat of the playa located immediately below could not have been an encouraging settlement during the wet season, the area of the circular features may offered a good shelter[7].

2-Vegetation and Holocene climate of Sheikh El-Obeiyid (Farafra Oasis): The presence of large trees like *Tamarix aphylla* and *Ficus sp*. (Table 3) which are tropicals and sensitive to drought indicate a deep soil with permanent water supply which may be stored from ancient times[1,35]. Also, the growth of *Acacia* trees in this time indicated the large amount of summer rains brought by monsoon climate. The presence of *Juncus* remains indicated the Mediterranean effects of the flora in the southern region, as stated[4,5].

The lack of archaeological and archaeobotanical evidences in the period between 8500 and 7500 uncal. b.p. indicates a severe arid phase also recognized in the El Bahr Playa area. This phase is demonstrated at Bir El-Obeiyid by thermoclastic rubbles and aeolian sand accumulation[7]. Wet climate in the Western Desert of Egypt (7000–6500 b.p.) was confirmed[5], when the subtropical vegetation zones were extended towards the north about 500-600 km more than today. Irregular topography of the desert resulted in forming relatively dense and contracted vegetation in depressions, wadis and runnels[36] this maximized the rainfall effects many times.

A-Reed swamp vegetation: *Tamarix nilotica, Juncus sp*. and *Samolus valerandii* remains retrieved from deposits of different playas at Sheikh El-Obeiyid (Table 3), indicated a reed vegetation with more moist conditions than today. *Juncus* and *Samolus* growth is restricted to swampy habitats but *Tamarix nilotica* has a wide spread in the Western Desert[2,21,37]. Many features are located all around the playa basin, mainly on its northern side and only partially extending into the lowest part of the basin. This fact points to the existence of an active playa basin during the occupation phases[7].

B-Desert Savana: Charcoal remains of *Acacia, Tamarix, Cyperus* and *Chenopodiaceae* identified from Sheikh El-Obeiyid wadi recognized a dense past vegetation, this vegetation was protected by the wadi and its tributaries. This type of vegetation need high temperature and dense summer rain, this revealed the climatic change of humid Middle Holocence climate to the present hyperarid. In the Qattara Depression (Sitra) dated around 6700 b.p. *Acacia, Tamarix* and *Chenopodiaceae* are identified as part of the recent vegetation at the Qattara Depression[38,39]. Remains of the same were identified from the Hidden Valley 6700 b.p.[10,25]. The above described vegetation in association with *Panicum turgidum* as Desert Savana[40].

The archaeology and archaeobotany of the Hidden Valley is comparable to that of Nabta Playa dated to 8000 b.p. [41] and Eastpans dated to 6200 b.p.[25]. Sheikh El-Obeiyid, Djara and the Hidden Valley have the same limestone soil and the same amount of rainfall, but they lie higher elevation than the Hidden Valley. The higher the altitude the lower water availability and therefore lack of species with a more water demands (i.e Sudano-Zambezian affinity).

C-Vegetation around Bir El-Obeiyid: Bir El-Obeiyid Playa context included the largest number of plant remains, mostly swampy vegetation. This can be attributed to the presence of the perennial spring, which made the area fertile with irresistible attraction in different periods, Early Stone Age, Middle Stone Age and Pleistocene, which were identified at the base of the plateau[7]. The high quality bifacial production artifacts (Middle Holocene contexts) are almost always surface finds. These products include bifacial knives, tools from side-blow flakes, lens-shaped arrowheads/drills. The lens-shaped projectile point is a bipointed arrowhead which may have been worked by invasive or covering retouch[42]. This tool is well known in many Egyptian contexts from the Middle Holocene to the Predynastic and the Old Kingdom periods[42].

Conclusion

Based on Archaeobotanical and Archaeological evidences, there are three active occupation periods in Sheikh El-Obeiyid Neolithic site, the first period extended from 7530–6166 b.p. in El-Bahr Playa, and the second period extended from 6320 – 6170 b.p. in Valley 1 and Bir El-Obeiyid Playa and the third period from 5790 – 5360 b.p. in Valley 1 and Valley 3. Identified plant species indicated a moist conditions of small lakes with their surrounding *Tamarix nilotica, Juncus sp., Cyperus sp*, and *Samolus valerandii*; in the Wadi El-Obeiyid and its tributaries *Acacia*, *Tamarix aphylla* and *Ficus* trees forms a desert savanna vegetation. The recorded types of vegetation proved that there are obvious effects of monsoon summer and Mediterranean winter climate on the vegetation of the Holocene in Sheikh El-Obeiyid area. There is a similarity of archaeological features between the Sheikh El-Obeiyid and the nearby Hidden Valley basin; both of them were active in the seventh millennium b.p. Though, the final phase of the Hidden Valley chain has shown a rising arid tendency; from 6000 b.p. the stable structures were neglected and the lake basin was filled with fine sand. A new damp stage, identifiable in the geostratigraphic tests and dating to c. 5500 b.p., in the Sheikh El-Obeiyid basin, also in Hidden Valley and other areas of the Farafra depression[7].

Table-3
Identified palaeobotanical plant remains retrieved from the studied sites in Farafra Oasis. D: Desiccated; C: Charred; W: Wood Sa-si: Saharo-sindian; S-Z: Sudano-zambzian; M: Mediterranean.

Site	El Bahr	SK-OB Valley 1		SK-OB Valley 3	BR-El-Obeiyid	Chorotype
Number of samples	5	14		1	1	
Total volume of samples (L)	15	30		3	3	
Feature	Hearth	Hearth	Feature1 Layer 1 Sector 9 D IV hearth 1	Feature 1 Layer 1 Sector 9 D IV hearth 2	h06-133	h1 a2, a3, b3	
Depth from surface (cm)	2-10	6-15	4-13	4-20	5	8	
Acacia (C.W.)	-	-	15	-	-	20	S-Z
Chenopodiaceae (D. leaf) Indet.	-	-	-	-	-	3	-
Cyperus cf. *rotundus* (C. nutlet)	-	-	-	-	-	1	Tropical
Ficus (C.W.)	-	-	-	6	-	-	Palaeotropical
Hydrophyte (D. stem) Indet.	-	5	-	-	-	-	-
Juncus sp. (D. culm)	-	-	-	-	-	3	Sa-Si, S-Z, M
Samolus valerandii L. (D. seed)	-	2	25	-	-	-	Cosmopolitan
Tamarix aphylla (C.W.)	1	-	-	-	-	-	Sa-Si, S-Z
Tamarix nilotica (W)	-	1 D	-	-	-	1C	Sa-Si, S-Z
Tamarix (C.W.)	14	-	-	-	6	-	Sa-Si, S-Z

Acknowledgment

The author is grateful for Prof. Barba Barich and Dr. Giulio Lucarani, Department of Archaeology and Anthropology, University of Rome, La Sapienza, for their help to collect and study the archaeobotanical samples from the studied area.

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