

A New Archaeobotanical Evidence of Castor Plant, *Ricinus communis* L. from the Central Sudan

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Abstract: *The paper presents new archaeobotanical evidence for castor plant, Ricinus communis L. recovered from the site of Kabbashi Haitah, north of Khartoum in the Central Sudan in a form of two plant impressions in a type of pottery which is associated with the Early Khartoum culture. The two plant impressions in pottery represent the earliest botanical evidence recovered—so far— from the Central Sudan and elsewhere in east and north Africa. Examination of the two seed impressions in pottery and their positive casts indicate that castor plant was naturally/spontaneously growing in the area and was probably used by population living at this site around 7700 bp. Furthermore, the ecological and climatic conditions in the region during the occupation of the site were favourable for the spontaneous growth of this plant species. No evidence is found in the remains of the material culture which might indicate the likelihood of its being imported.*

1. Background

Archaeobotanical studies were partly or fully incorporated in prehistoric research in the Central part of the Sudan since the late nineteen forties (e.g. Arkell, A.J. 1949: pp. 108-109; 1953: pp. 80, 103, 105) and until the end of the last century (e.g. Haaland. R. 1981: pp. 121-122; 1987: pp. 76-77, 227; Klickowska, M. 1978: pp. 42-43; Krzyzaniak, L. 1978: pp. 67 – 69; 1979: pp. 159 – 172; Magid, A. 1982; 1989; 1995: pp. 147 - 177; Magid, A. and I. Caneva. 1998: pp. 79 - 89; Mohammed-Ali, A.S. 1982: 60, 89, 101, 104, 138-39, 162; etc.). All of these studies are focused on evidence of food-plants recovered from Early and Middle Holocene sites, dated between 9000 – 6000 bp (Map 1). Evidence of inedible plant remains is repeatedly recovered from the same archaeological contexts where evidence of food-plant was found but little attention is paid to the study of those remains beyond their identification and documentation. Consequently, most reconstructions of the culture history of the Central Sudan during the Early and Middle Holocene are largely impaired as regards the nature and origin

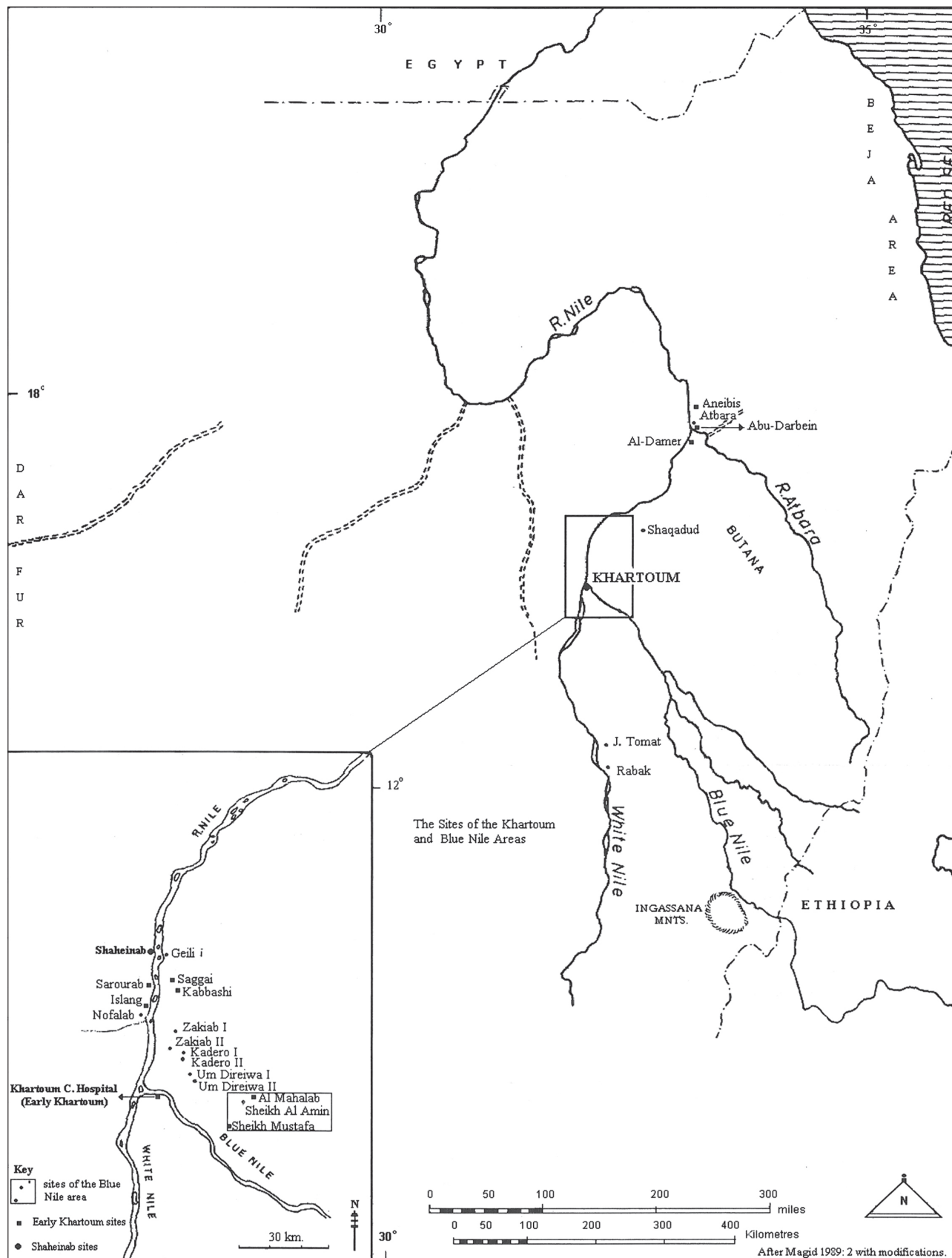
of those inedible plants, their possible uses and cultural significance. Nonetheless, some publications on archaeobotanical data from the same region started to emerge during the last decade (e.g. Magid, A. 2003: pp. 245-272) showing more engagement of researchers with studies of archaeological plant remains which are not suitable for human consumption but might have been utilized for purposes other than food.

The present work is, exclusively, focused on two pieces of archaeobotanical evidence of inedible plant remains recovered from an Early Holocene site in the Central Sudan. In this work, I shall examine the nature of the evidence and its origin and possible uses.

2. Context, nature and credibility of the evidence:

2.1 Context

The archaeobotanical evidence was recovered from the prehistoric settlement site of Kabbashi Haitah situated on the east bank of the Nile River c. 34 km. north of Khartoum in the Central Sudan (Map 1; Caneva, I., et al, 1993: p.183; Magid, A. and I. Caneva. 1998:



Map 1: Early and Middle Holocene sites in the Central Sudan. After A. Magid, 2003: 347.

p.80). Geomorphological and hydrogeological interpretations of air and satellite images from the area along the Nile north of Khartoum revealed that the site of Kabbashi Haitah is located on an ancient bank of a palaeochannel of the Nile River (Map. 2; Magid, A. and I. Caneva. 1998: pp. 80-81; Marcolongo, B. and M. Mascellani. 1983: pp. 39-45; Marcolongo, B. and A.M. Palmieri. 1998: pp. 35-37).

Culturally speaking, the site belongs to the “Early Khartoum” (elsewhere labelled Mesolithic⁽¹⁾) culture, which existed in the Central Sudan during the Early Holocene period (Caneva, I., et al, 1993: p. 183; Magid, A. and I. Caneva. 1998: p. 80). This interpretation is based on radiocarbon dates (of 7700 to 7200 bp) obtained from the site as well as the recovery of Early Khartoum types of lithic artefacts and pottery including wavy-lines type (Caneva, I., et al, 1993: p. 183; Magid, A. and I. Caneva. 1998: pp. 80-82). The wavy-lines pottery (Fig. 1a) is considered (by most archaeologists working on Early Holocene sites in Sudan) as the characteristic ware and the main diagnostic cultural feature of the Early Khartoum Culture.

2.2 Nature of the archaeobotanical evidence

The evidence consists of two impressions of seeds of castor plant, *Ricinus communis* L. in two Early Khartoum type of potsherds (Fig. 1b). One impression was found on the exterior surface of one of the potsherds (with wavy line decoration) and the other on the interior of the other sherd (Fig. 1b). The wall-thickness of both sherds is adequately broad to envelop the relatively sizeable seeds. Obviously, the seeds were burnt during the firing of the pottery vessels leaving behind cavities which retain more or less the same external morphological features of the seeds. Positive casts were made of the two cavities/impressions. As seen from their positive casts, the impressions of the seeds are flattened-oblong in outline, broadly



Fig. 1a: Early Khartoum pottery. (after Magid & Caneva, 1998: 82).

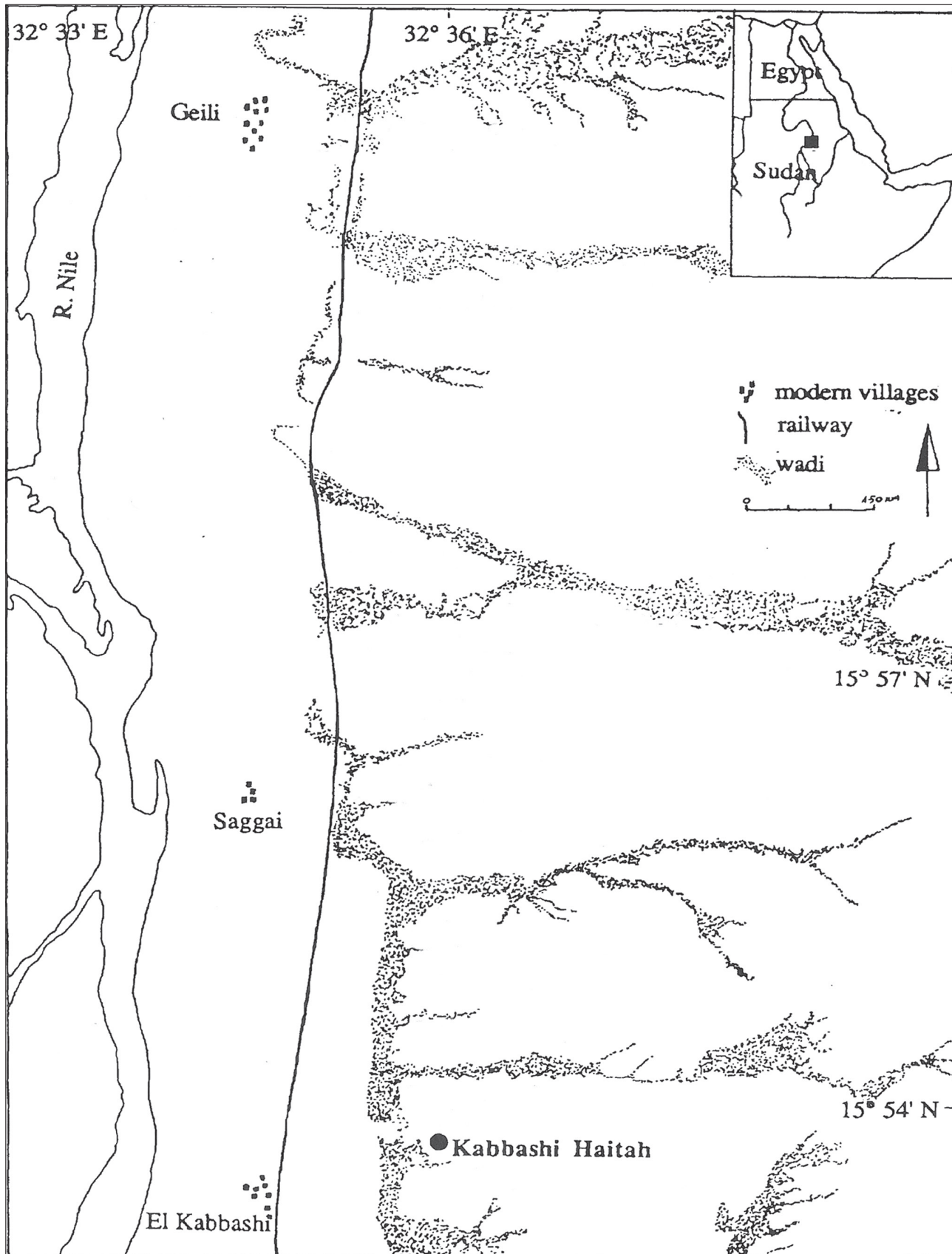


Fig. 1b: Potsherds with impressions of castor plant - seeds.

elliptical with blunt distal ends and a slight protrusion at the proximal ends. These seeds were identified as seeds of castor plant, *Ricinus communis* L. (Fig. 2a & Fig. 2b). The methods and techniques used to make the positive casts of the impressions, and to examine and identify the positive casts are based on those published by A. Magid (1989: pp. 71-82; 1995: pp. 155-157) as well as a laboratory manual for making positive casts of plant impressions in pottery published by A. Magid and K. Krzywinski (1995: pp. 121-132).

2.3 Credibility of the evidence

The seed-impressions of castor plant *R. communis* L. in pottery recovered from the site of Kabbashi Haitah, to our best knowledge, represent the earliest evidence (c. 7700 bp.) of castor plant to be found—so far—in the



Map 2: Location of the site of Kabbashi Haitah on an ancient river bank. After A. Magid and I. Caneva, 1998:8 (with modifications).

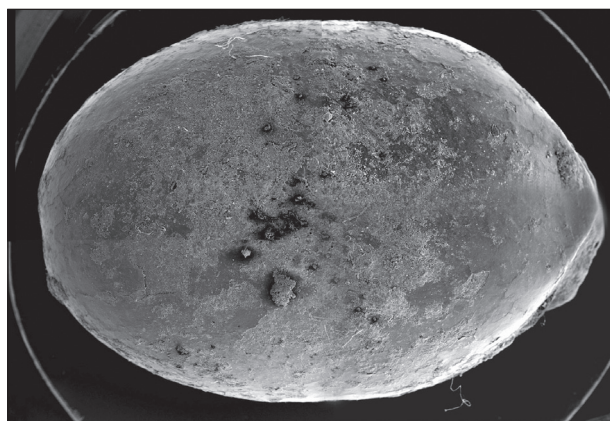


Fig. 2a: Positive cast of castor plant seed.

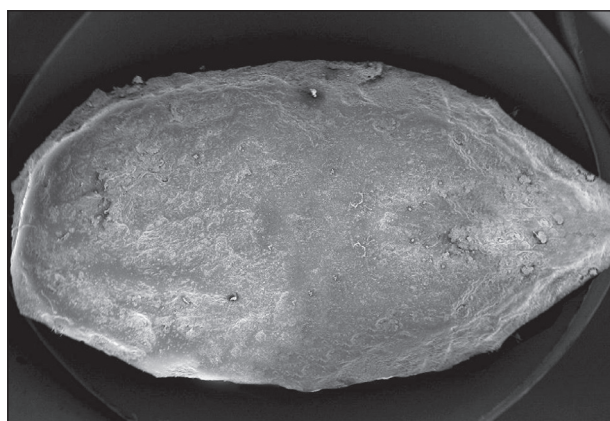


Fig. 2b: Positive cast of castor plant seed.

Central Sudan and elsewhere in north and east Africa, hence these findings are of special archaeological and botanical value.

Contextually, one may suggest that they are found *in situ* and they remain in that position as long as the potsherds are not damaged. In all probability, the original castor-seeds were accidentally incorporated in the clay while shaping the pottery in or around the settlement area not long after those seeds were shed (or detached) from their fruits.

That is to say, the age of the original seeds is or more or less contemporary with that of the potsherds in which they were accidentally incorporated. This interpretation is based of the following indicators:-

1) Once the pottery is burnt, the impressions

of the seeds would, similar to the pottery, be permanently preserved. Hence, there is a direct association between those seeds impressions and the potsherds in which they are found (Magid, A. 1989: p. 74).

2) Since the Early Khartoum type of pottery is tempered with minerals, i.e. inorganic temper, (Francaviglia and Palmieri. 1983: pp. 192, 198-204; Magid, A. and I. Caneva. 1998: pp.85-86), the evidence of impressions of the seeds in pottery strongly indicates that the original seeds were not part of the temper. Accordingly, it is most likely that some parts of the castor plant or whole plant (including the seeds) were brought to the settlement area for other purpose(s). Thus some of these parts (in this case, the seeds) were accidentally incorporated in the clay while shaping the pottery vessels (Magid, A. and I. Caneva. 1998: pp. 85-86).

3) The typology of the potsherds (i.e. wavy-line ware) in which the impressions are found (Fig. 1b) is well established within the bounds of Early Khartoum cultural tradition. Moreover, the potsherds were found *in situ* within a cultural context which is radiocarbon dated to 7700 and 7200 bp. These dates place the site within the chronology of the Early Khartoum culture (Magid, A. and I. Caneva. 1998: p. 85).

It is, indeed, fortunate to find this exceptional and invaluable evidence of castor seeds impressions in pottery for the following main reasons:

1) Unless properly stored and protected, seeds of castor plant do not generally store well for long periods of time (<http://1>) because the testa (the exterior layer) of the seed is fairly thin and often brittle (Weiss, E. A. 1971: p. 66). This is particularly relevant in this context (i.e. the archaeological site and the

Central Sudan in general) where conditions are generally unfavourable for preservation of plant remains (Magid, A. 1989: pp. 66-67; 1995: pp. 148-149; 2004: p. 10).

- 2) It is rare to find impressions of fragile and sizeable seeds in pottery from an Early Khartoum type of sites in the Central Sudan (Magid, A. 2003: pp. 348). Previously, evidence of impressions of sizeable seeds which were found at this type of sites belong to seeds with hard and woody testa and/or structures, e.g. *Ziziphus spina christi* L. (Willd) *Celtis integrifolia* (Lam) *Grewia tenax* (Forsk) Fiori. etc. (Magid, A. 1989: p. 83; 1995: pp. 158-159; 2003: pp. 353).
- 3) Had the vessels (from which the potsherds with impressions are derived) been burnished, these seeds would have probably been found during the burnishing process, and hence removed from the walls of the vessels before the vessels were burnt.
- 4) The excavation grid and process included the area where the potsherds with plant impressions were buried, otherwise this evidence would not have been found.

3. Origin of castor plant found at the site of Kabbashi Haitah in the Central Sudan and its conceivable uses some 7700 years ago

Since the evidence of castor plant *R. communis* L. represents the earliest occurrence of its type to be found—so far—in the Sudan (as well as in north and east Africa), its discovery in this area raises many issues and questions such as existence of other early evidence of castor plant elsewhere in the region and the World, theories on the natural habitat and the native land(s) of the plant and its possible uses. These issues and questions are beyond the scope of the present study but are discussed within a wider context in a separate work (A-Magid, forthcoming).

The discussion in the foregoing account focused on the recovery and identification of the evidence including its context and credibility. Inseparable from these, are three other issues which can be summarized as follows:-

1. The status of the archaeobotanical evidence recovered from the prehistoric site of Kabbashi Haitah.
2. The origin of the evidence of castor plant found at the site.
3. Implications of the presence of castor plant at the site, and its potential uses some 7700 years ago.

3.1 The status of evidence

In this section, the discussion is focused on the status of the two impressions of castor plant as to whether they belong to naturally/spontaneously growing or domesticated species.

Ideally, more than one part of the castor plant, such as the seed, its compartment /capsule in the fruit (Fig. 3c), parts of the stems and/or branches of the plant, are required in order to draw a conclusive identification as to whether the species is naturally/spontaneously growing or domesticated. For instance, naturally growing castor plant has solid branches and stems while these parts are hollow in the domesticated species (Weiss, E.A. and 1971: p.56). In addition, complete or partly preserved parts of the capsules/fruits (in which the seeds are encased), particularly at their proximal end where the seeds are attached, provide another platform for studying the diagnostic feature of the abscission zone (as this zone is rough and robust in domesticated species but smooth and yielding in the naturally/spontaneously growing ones). As stated earlier, the preservation conditions in the Central Sudan are not favourable for the preservation of those perishable parts. Thus, in the absence of remains



Fig. 3a: Seeds of castor plant.



Fig. 3b: Fruits and seeds of castor plant.



Fig. 3c: Castor plant.



Inflorescence and coloured leaves.

of branches or fruits, our examination of the status of the plant is derived on the basis of the impressions and their positive replicas (aided by high power microscope and reference collection

of extant seeds). The examination revealed that the caruncles at the proximal end of the seeds as seen in the extant reference collection (Fig. 3a), are not preserved in the seed-impressions

or their positive replicas (Fig. 2a and Fig. 2b). It is also possible the caruncles were solidified leaving behind smooth and yielding area. Accordingly, there is reason to suggest that the impressions of the seeds belong to a naturally/spontaneously growing plant species. Incidentally, no evidence of archaeobotanical remains that belong to domesticated food plant species was found at the Early Holocene site of Kabbashi Haitah (Magid, A. and I. Caneva, 1998) or any other contemporary site in the Central Sudan (Magid, A., 2003). Therefore, it would have been rather “out of context” to find evidence of inedible plants which are domesticated at the site. Furthermore, all archaeologists and archaeobotanists working in the Central Sudan (e.g. Arkell, A.J. 1949; 1953; Clark, J.D. 1984; Haaland. R.; 1987; Krzyzaniak, L. 1978 1979; Klickowska, M. 1978; Magid, A. 1982; 1989; 1995; 2003; Magid, A. and I. Caneva. 1998; Mohammed-Ali, A.S. 1982; etc.) are in agreement that all the archaeological evidence both biological (flora and fauna) and material culture remains, recovered from Early Holocene sites in the Central Sudan (including the site of Kabbashi Haitah), indicate an adaptation in which hunting and gathering of naturally growing plants were practised.

The difference in size of the two seeds is probably attributed to the position of the original seeds-bearing fruits in the plant; those at the lower (bottom) part of the plant are usually mature, hence bigger than those at the upper (higher) part where these were still maturing. As castor plant is perennial, it is also possible that the smaller seed is derived from an immature fruit. This assumption implicitly means that the plant was growing in the area or vicinity of the site.

3.2 Origin of the castor plant found at the site

As stated above, the evidence of castor

plant *R. communis* L. recovered from the site of Kabbashi Haitah in the Central Sudan represents the earliest evidence of this plant in the north and east African regions. Therefore, there are reasons to suggest that the Central Sudan is one of (if not) the earliest natural habitat of this plant species in east tropical Africa. This interpretation is derived on the following bases:-

- 1) During the occupation of the site of Kabbashi Haitah, some 7700 - 7200 years ago, the climatic and ecological conditions in the Central Sudan provided optimum habitat (i.e. moderately hot, full light, minimum of 500 mm. of annual rainfall, soil, location by a river bank, etc) for the natural growth of castor plant. This interpretation is further based on the following grounds: -
 - 2) (a) Palaeoclimatic research in Eastern Sahara and the Sudan (e.g. J. Brewer, 1992; F.A. Hassan, 1998; C. V. Haynes, et al. 1989; J. Lario, et al. 1997; M.A.J. Williams and D.A. Adamson. 1982) indicates that during the occupation of the site of Kabbashi Haitah, the climatic conditions in the Central Sudan were much wetter (with annual rain between 500 to 700 mm) than the prevailing semi-arid conditions.
 - (b) Pollen analytical studies (conducted by e.g. D. A. Ibrahim, 1993 and R.G. Khalafalla, 2002) indicate that the Early Holocene Central Sudan was characterised by a savannah ecosystem and that a wet period and palaeolakes prevailed in the period between 8000 – 6500 bp.
 - (c) Archaeobotanical evidence recovered from the Early Holocene sites (including the site of Kabbashi Haitah) in the Central Sudan (Map 1) attested the presence of

other naturally growing plant species that required swampy habitats and/or at least 500 mm of annual rainfall (Magid, A. 1982; 1989; 1995; 2003; Magid, A. and I. Caneva. 1998).

- 3) Ecologically speaking, studies on the fossil hydrological network, soils and vegetation show that during the occupation of the site of Kabbashi Haitah, there were three ecological bands running parallel to the Nile River (Caneva, I., et al. 1993: pp. 181-183). The middle band is an old terrace of a palaeochannel of the Nile River. As shown on Map 2, the Early Holocene site of Kabbashi Haitah is situated in this area and delimited north and south by two seasonal streams (ibid.: p. 183; Magid, A., and I. Caneva, 1998: 79). West of this band is the flood plain and east of it is the savannah grassland. The latter is characterised by a developed fossil hydrological network (ibid.: p. 181).
- 4) Culturally speaking, no archaeological evidence is found of imported items or any other evidence which might indicate contacts with other region(s) where castor plant grew naturally. On the contrary, evidence of material culture remains recovered from the site indicates that there was a gradual cultural development and transformation (Caneva, I., et al. 1993: pp. 197, 247). In short, all indications diminish the possibility of the introduction the castor plant from other area (region) and support the likelihood of its local origin.

3.3. Possible uses of castor plant at the settlement site of Kabbashi Haitah

The physiological characteristics of castor plant, *R. communis* L. provide a platform to suggest that the prehistoric population of the site of Kabbashi Haitah were first attracted to

the plant by its slender appearance, yet powerful character as represented in its handsome leaves, flowers (Fig. 3c) and colourful seeds (Fig. 3a), and the fascinating shedding of its pollen and explosive shattering mechanism of its fruits and dispersal of its the seeds (Fig. 3b). As this plant grew tree-like in the favourable climatic and ecological condition of the Kabbashi Haitah area (and Central Sudan), the population of the site and that of the wider Central Sudan probably used its dense shade (casted by its abundant leaves) to protect themselves against combined effect of heat and bright-tropical sunlight. Its attractive seeds (Fig. 3a) were probably used for bodily adornment such as necklaces and bracelets. Having some poisonous properties, if the seed coat is destroyed, it might have caused skin irritation at the contact point with the body. Consequently, it is most likely that the population of Kabbashi Haitah realised through experience the harmful effect of the castor-seed necklaces and bracelets. It is also possible that they discovered the poisonous effect and probably the medicinal value of castor-seeds (and the whole plant) by chance or through some accidents where some of the members of the community recovered from its poisonous effect and others died. One scenario is that the attractive and tempting castor seeds enticed the children (and probably adults) to savour, hence they got poisoned by sucking or eating castor-seed beads or seeds found in the settlement-area or its vicinity.

On the assumption that the population discovered the poisonous effect of the castor plant combined with the powerful mechanisms of its pollination and dispersal of seeds, one is enticed to suggest that these occurrences left a strong impression (e.g., of fear, respect, fascination, etc.) on the population of the site and that was translated or expressed in some form of mystical sentiments and/or symbolic rituals.

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ملخص: تقدم هذه الورقة دليلاً أثارياً نباتياً جديداً على نبات الخروع (*Ricinis communis L*)، عُثر عليه في موقع كباشي حيطة شمال الخرطوم في السودان الأوسط، وجاء على هيئة أثرين نباتيين مطبوعين على نوع من بقايا الأنية الفخارية العائدة إلى ثقافة الخرطوم الأولى. هذان الأثران النباتيان المطبوعان على بقايا الأنية الفخارية هما أقدم الأدلة النباتية المكتشفة (حتى اليوم) في السودان الأوسط وشرقي إفريقيا وشمالها. ودراسة بذرة هذين الأثرين المطبوعين في البقايا الفخارية تشير إلى أن نبات الخروع ينمو محلياً في المنطقة، ومن المحتمل أن سكان المنطقة (حيث موقع الاكتشاف) كانوا يستخدمونها منذ ٧٧٠٠ سنة (قبل الزمن الحاضر). ومن المؤكد، أن ظروف المنطقة البيئية والمناخية إبان سكنى الموقع كانت مناسبة لنمو أنواع هذا النبات، كما أن بقايا الثقافة المادية لا تقدم دليلاً على احتمال استيراد هذا النبات.

Notes

- (1) The present writer stated elsewhere (Magid, A. 2003) his reservation as regards the current usage and implications of the term Mesolithic for the Early Khartoum type of sites in the Sudan, hence he elected to identify this culture with the name of its first excavated site, namely "Early Khartoum" (Fig. 1; Arkell, A.J. 1949). Chronologically, he also often refers to Early Khartoum type of sites as Early Holocene sites since all of those sites are radiocarbon dated to that period.
- (2) I would like to thank Professor Isebella Caneva of Rome University, Italy, in her capacity as the leader of the Italian excavation team of the Early Holocene site of Kabbashi Haitah, in the Central Sudan., for making it possible for me to examine a collection of potsherds excavated from the site.

References

- Arkell, A. J. 1949. **Early Khartoum**. Oxford University Press
- Arkell, A.J. 1953. **Shaheinab**. Oxford University Press.
- Brewer, J. 1992. Incremental growth Structures in the Nile Fish and Molluscs from Archaeological Sites as Indicators of Holocene Environmental Change in Egypt. **The Holocene**, 2: pp.30 – 36.
- Caneva, I.; E.A.A. Garcea; A. Gautier and W. Van Neer. 1993. Pre-Pastoral Cultures Along the Central Sudanese Nile. **Quaternaria Nova**, III: pp.177-252.
- Clark, J.D., 1984. The use of the Bored Stone in Abyssinia. *Man*, no. 25: pp. 31 – 32.
- Francaviglia, V. and A. M. Palmieri. 1983. Petrochemical Analysis of the "Early Khartoum" Pottery. In I. Caneva (Ed.): **Pottery Using Gatherers and Hunters at Saggai 1 (Sudan): Preconditions for Food Production**. pp. 191-203. Origini XII. Rome.
- Haaland, R. 1981. **Migratory Herdsmen and cultivating women. The structure of Neolithic seasonal adaptation in the Khartoum Nile Environment**. University of Bergen.
- Haaland, R. 1987. **Socio-economic Differentiation in the Neolithic Sudan**. Cambridge Monographs in African Archaeology 20. BAR International Series 350.
- Hassan, F.A. 1998. Holocene Climatic Change and Riverine Dynamics. In S. De Lernia and G. Manzi (Eds): **Before Food Production in North Africa. Questions and Tools Dealing with Resource Exploitation Dynamics at 12000- 7000 bp**. pp. 43-51. A.B.A.C.O. Edizioni. M.A.C. srl, Forlì.
- Haynes, C. V.; .H., Elyes; L.A., Pavlish; J. C., Ritche; M., Rybak., 1989. Holocene palaeoecology of Eastern Sahara; Salima Oasis. **Quaternary Science Review**, 8 (2): pp.109 – 136.
- Ibrahim, D. A. 1993. **The Vegetation History of Two Mayaas (water ponds) in the Central Sudan**. Unpublished M.Sc. University of Bergen, Norway.
- Khalafalla, R.G. 2002. **Vegetation History of the Southern Kordofan Savanna: A study from the Keilak and Leya Lakes (Western Sudan)**. Unpublished M.Sc., University of Bergen, Norway.
- Klickowska, M. 1978. Preliminary Results of Palaeobotanical Studies on Plant Impressions on Potsherds from the Neolithic Settlement at Kadero. **Nyame Ahuma**, no. pp. 12: pp. 42-43.
- Krzyzaniak, L. 1978. New Light on Early Food-Production in Central Sudan. **Journal of African History**, 19: pp. 159-172.
- Krzyzaniak, L. 1979. Polish Excavation at Kadero. **Nyame Akuma**, no. 15: pp. 67-69.
- Land Protection, 2001. Castor Oil Plant. *Ricinus Communis*. The State of Queensland **Department of Natural Resources and Mines QNRM01261**. pp.44-45.
- Lario, J.; S. Schánchez-Moral; V.M. Fernández; A. Jimeno and M. Menéndez. 1997 Palaeoenvironmental Evolution of the Blue Nile (Central Sudan) during the Early and Middle Holocene (Mesolithic-Neolithic Transition). **Quaternary Science Reviews**, 16: pp. 583-588.
- Magid, A. 1982. **The Khartoum Neolithic in the Light of Archaeo- ethnobotany. A case Study from the Nofalab and the Islang Sites**. Unpublished M.A., University of Khartoum, Sudan.
- Magid, A. 1989. **Plant Domestication in the Middle Nile Basin. An Archaeoethnobotanical Case Study**. Cambridge Monographs in African Archaeology 35. BAR International Series 523.
- Magid, A. 1995. Plant Remains and their Implications. In R. Haaland and A. Magid, (Eds.): **Aqualithic Sites along the Rivers Nile and Atbara, Sudan**. 147- 177. Alma Mater, Bergen, Norway.
- Magid, A. 2003. Exploitation of Food-Plants in the Early and Middle Holocene Blue Nile Area, Sudan and Neighbouring Areas. In V. M. Fernández (Ed): **Complutum. Holocene Archaeology in Central Sudan**. Vol. 14: 345 – 372. University of Complutense –Madrid, Spain.

Magid, A., and K. Krzywinski. 1995. The Method of Positive Casts of Plant Impressions in Pottery. A Field and Laboratory Manual. *Acta Palaeobotanica*, 35 (1). 121 – 132.

Magid, A. and I. Caneva. 1998. Exploitation of Food Plants in the Early Holocene Central

Sudan: A Reconsideration. In S. de Larnia and G. Manzi, (Eds.): **Before food production in North Africa. Questions and tools dealing with resource exploitation dynamics at 12000- 7000 bp.** A.B.A.C.O. Edizioni. M.A.C. sr1, Forlí: 79-89.

Marcolongo, B. and A.M. Palmieri. 1998. Dynamics of Natural Environment in the Geili Area. In I. Caneva (Ed.): **El-Geili . The History of the Middle Nile Environment 7000 B.C.- A.D. 1500.** Oxford : The British Archaeological Reports. Cambridge Monographs of African Archaeology, 29: pp. 35-47.

Marcolongo, B. and M. Mascellani. 1983 Late Quaternary and hydrology of the Khartoum-Sabaloka region (Sudan). In I. Caneva (ed.): **Pottery Using Gatherers and Hunters at Saggai 1 (Sudan): Preconditions for Food Production.** pp.39-45. Origini XII. Rome.

Mohammed-Ali, A.S. 1982. **The Neolithic period in the Sudan c. 6000-2500 B.C.** Cambridge monographs in Archaeology 6, BAR international series 139.

Weiss, E.A. 1971. **Castor, sesame and safflower.** Leonard Hill, London.

Williams, M.A.J. ; D.A. Adamson (Eds). 1982. **A land between Two Niles. Quaternary Geology and Biology of the Central Sudan.** Balkema, Rotterdam.

Internet Sites:

<http://1. Ricinus communis, L. Castorbean. http://www.plantdatabase.com/go/70/> (accessed. 03.04.2014).