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Exploitation of plants in the Eastern Sahel (Sudan), 5,000 - 2,000 B.C.

Since C. Knuth (1826) studied the desiccated fruits, grains and seeds which were recovered from the tombs of ancient Egypt, archaeoethnobotany has captured the interest of scientists in many fields of research such as genetics, botany, agriculture and archaeology. It has contributed immeasurably to our understanding of the evolution, exploitation, early farming and domestication of many of the major food plants (Renfrew 1973: 1).

In respect to the Sudan, archaeoethnobotanical research has not yet been firmly established. In spite of many difficulties, a number of contributions have been made through many but uncoordinated efforts.

A. J. Arkell can be considered the founder of archaeoethnobotanical research in the Sudan. The first botanical material was uncovered while he was excavating the site of Khartoum Hospital (Fig. 1) and a site near Gerif town (Arkell 1949: 108 - 10, Pl. 45, Fig. 3). Floral remains similar to those found at Khartoum site and some other macrobotanical finds were recovered from the Neolithic site of Esh Shaheinab (Arkell 1953: 80, 105).

From the 1960's onwards the state of research has developed considerably. More attention was paid to the plant remains while excavating archaeological sites. This is clearly illustrated in many works such as D. Clark and Ann Stemler (1975), Constantini *et al.* (1982, 1983), M. Hassan (1973), M. Klichowska (1978), L. Krzyżaniak (1978), A. Mohammed Ali (1982), F. Wendorf (1968), R. Haaland (1981) and G. E. Wickens (1975, 1982).

During the past four decades attention has increasingly been devoted to palaeoecological and palaeoeconomic studies. More interest is currently shown in an interdisciplinary approach to archaeozoological and archaeoethnobotanical research in the Sudan. In this paper archaeobotanical data and material culture are treated as equally important in an attempt to reconstruct the economic strategies related to the exploitation of plants in the Eastern Sahel (Sudan) for the period of 5,000 and 2,000 B.C. This region is divided into two areas, namely the Khartoum

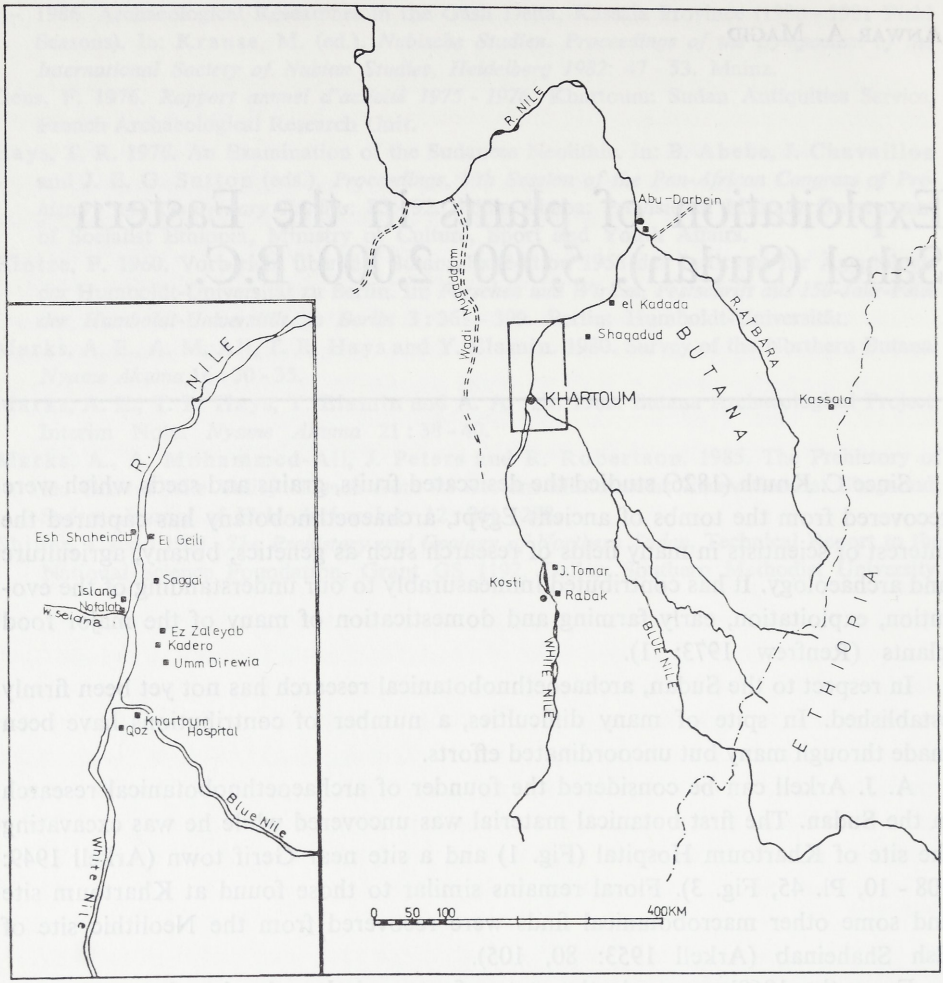

FIG. 1. Map of the Eastern Sahel (Sudan) showing the major archaeological sites in 5,000 - 2,000 B.C.

area (western part) and the Butana area (eastern part), in order to achieve a consistent presentation and interpretation of the data.

Taking into consideration the Khartoum area, nothing is known about the archaeology of the 1000 kilometres between the west bank of the river Nile and the Wadi Hawar (Mohammed Ali, personal communication). For the eastern part of this area, A. J. Arkell started the era of archaeological research (Arkell 1949; 1953). From the 1970's the area has witnessed very active archaeological investigations. Quite a number of sites were excavated, both on the east and west banks of the river Nile (El-Mahi 1982; Caneva 1983; Haaland 1981; Krzyżaniak 1978; Magid 1982; Mohammed Ali 1982, and many others).

One should mention that the data recovered from the sites is too meagre to permit a comprehensive picture of the available food plants. This is particularly true with the oldest site excavated in this area, namely the Khartoum Hospital site. The dates obtained from the Saggai, an Early Khartoum type of site, range between 7,410±100 B.P. and 7,230±100 B.P. (Caneva 1983: 152). The floral evidence recovered there consisted only of mumified (non-carbonized) seeds of *Celtis integrifolia* Lam. Arkell stated that "the fruits of this tree were no doubt gathered and brought to the sites as food" (Arkell 1949: 108 - 109). Plant species similar to those found at the site of Khartoum Hospital were identified from the sites of Esh Shaheinab, Islang and Nofalab situated on the west bank of the river Nile (Arkell 1953: 103; Magid 1982: 90-91). In addition, a carbonized shell of *Elaeis guineensis* Thumb. (which was thought to be from somewhere else) and *Zizyphus* sp. were found (Arkell 1953: 80, 105).

The material culture, *i.e.* the pottery and lithic artefacts from these sites is similar. The radiocarbon dates obtained indicate that they were more or less contemporary, ranging between 6,000 B.P. and 5,000 B.P. (Haaland 1981: 55 - 56; Magid 1982: 25 - 26). Although these are about 2000 years younger than the typical Early Khartoum type of sites, practices of collecting naturally growing food plants (*i.e.* fruits of *Celtis* and *Zizyphus* sp.) seem to have been relatively unchanged. It seems that exploitation of plants represented a minor element in the highly specialized fishing and hunting economies which were based on aquatic and terrestrial resources as in the case of the Khartoum Hospital site and with a substantial component of pastoralism based on domesticated cattle supplemented by fishing and hunting for the younger (Neolithic) sites on the west bank. The evidence of wild sorghum, *S. verticilliflorum* Stend. (Stapf.) recovered from Esh-Shaheinab site (Magid 1982: 98) indicates that it was exploited. The domesticated form of this species is at present a staple food plant in the Sudan.

The floral evidence derived from the sites situated on the east bank of the river Nile was derived both from fossil seeds (Krzyżaniak 1978) and from their impressions on potsherds of typical Esh Shaheinab Neolithic pottery (Haaland 1981: 195 - 196; Klichowska 1978: 42 - 43). Fossil seeds of *C. integrifolia* Lam., and *Hyphaene thebaica* (L.) Mart. were found at the site of Kadero 1. Furthermore, impressions of several taxons of *Gramineae* were identified (Klichowska 1978: 43). In the light of these finds, it has been suggested that the occupants of the Kadero 1 site were practising plant gathering and perhaps also the cultivation (Krzyżaniak 1978: 160).

Evidence of seeds of *C. integrifolia* Lam. was reported from all the sites on the east bank except the site of Kadero 2 (Haaland 1981: 195). In addition, evidence of impressions of wild sorghum *S. verticilliflorum* Stend. (Stapf.) was recovered from the sites of Zakyab (5 impressions), Umm Direwia (4 impressions) and Kadero 1 (*ibid*). These results confirm the preceding interpretation that gathering and cultivation of plants were in evidence, but what have been identified as domesticated sorghum *S. vulgare* Pers., is doubtful. A re-examination of the evidence suggests

the possibility that the impression is that of unripe seed of *C. integrifolia* Lam. (*ibid*: 196 - 197).

The floral evidence from these sites exhibits a wide variety in comparison with the plant species recovered from the sites on the west bank. All these sites, both from the east and west banks, have similar material culture and to a large extent are contemporary (*ibid*: 55 - 56; Magid 1982: 25 - 26). Special attention seems to have been devoted to exploiting different secies of the *Gramineae* family such as sorghum, millet and fox-tail millet on the east bank. Consequently, cultivation activities were performed on a larger scale. This may be attributed to the availability of alluvial plains that extend to several kilometres inland on the east bank, while the cultivable land on the west bank was and still is limited to the flood-plain, an area only few hundreds of metres wide. Thus, it is reasonable to assume that the occupants of the west bank adopted domestic animals, mainly cattle, as the basis of their adaptive strategies in preference to plant cultivation.

If we now turn to the Butana area, we see that active archaeological research is currently in progress (Constantini *et al.* 1982; Marks *et al.* 1980; 1982). Although the study of the botanical remains recovered from the excavated sites in this area is not yet completed, the results obtained so far will be cited with special emphasis on the data from the Shaqadud cave because the study of the latter is now more advanced than that of the other sites.

The dates obtained from the Shaqadud cave-site indicate that the cultural deposit started to accumulate there 4,200 years B.P. and that the site was abandoned *ca* 3,600 B.P. (Marks *et al.* 1984: 17). The floral remains being studied at present consist of carbonized seeds. The results obtained attest the presence of a variety of species/genera. These include grains of *Pennisetum* sp. (Brum.) Stapf. and Hubbard, one grain of *Sorghum* sp. Stapf., grains of *Panicum trugidum* Forsk., seeds of *Solanum dubium* L., *Setaria* sp., and *Cortolaria* sp. Beside these, fruit-stones and seeds of *Zizyphus* sp. Lam., and *Grewia* sp. (Forsk.) Fiori, were also recovered (Magid 1984: 27 - 28).

The external features of *Pennisetum* sp. closely resemble the cultivated millet grown at present across the belt situated further to the south of Shaqadud. It is not yet certain if the remains are of domesticated plant but their recovery from Shaqadud provides one of the earliest evidence of the species from the Sudan. On the basis of the depth at which these grains were found (1.4 - 2.5 m) they can be dated to 2,500 years B.P. (Marks *et al.* 1984: 20). The earliest evidence of domesticated *Pennisetum* was found at the site of Dar Tichitt in south-central Mauretania dated to 1,000 B.C. (Stemler 1980). The results of the current research dealing with the origins of African cereals suggest that the presumed progenitor of millet was a product of the Sahel zone and that its basic distribution is diffused (Harlan and Stemler 1976; Harlan 1977; Stemler 1980), extending from West Africa to the eastern part of Sudan (Portérés 1976), including the Shaqadud area.

Although the grain of *Sorghum* sp. is very similar to the wild species of sorghum (known as *Adar*), it is not yet possible to identify it to the species level. The area of Shaqadud is, however, within the zone where cultivation of sorghum was supposed to have involved (Harlan and Stemler 1976) (Fig. 2).

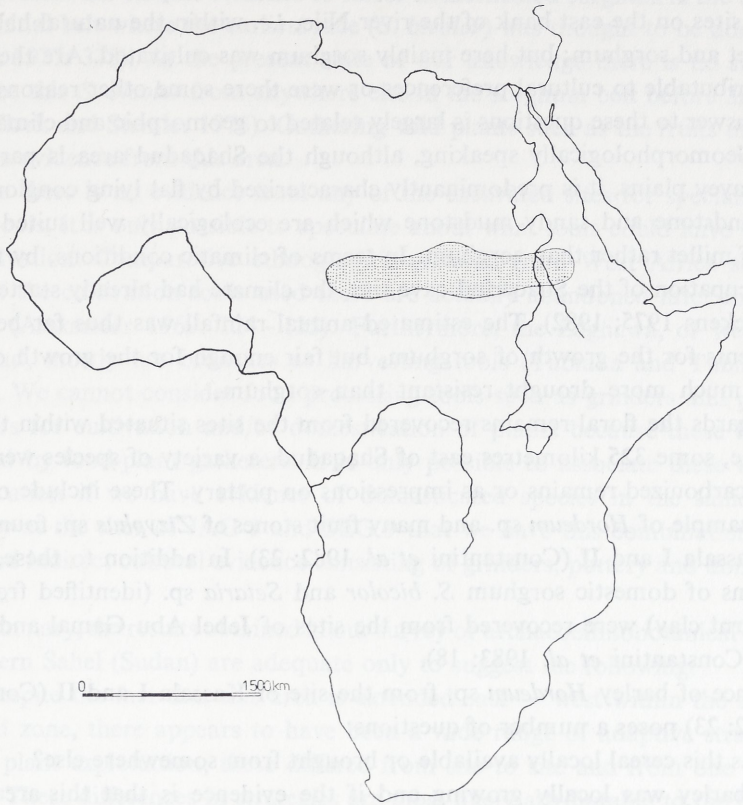

FIG. 2. The early belt of the wild-growing sorghum (after Harlan and Stemler 1976)

Other plant species of Shaqadud such as *Panicum turdigum* Forsk., *Setaria* sp., being annual grasses, were probably collected during the rainy season as food-plants. Furthormore, fruits of *Zizyphus* sp. and *Grewia* sp. were also gathered. Since the interpretation of the distribution of these plant species within the cultural deposit will involve issues which are not directly related to the theme of this paper, I shall confine myself to the economic implications of the evidence recovered. In this connection, besides the domesticated animals and wild game, it seems that the Shaqadud cave occupants were exploiting plants by pursuing two different but co-ordinated strategies. One of these was plant-gathering as evident in the remains of the fresh and/or dry and sweet edible fruits of *Zizyphus* sp. and *Grewia* sp. The local inhabitants of the area, particularly children, still practise such activities.

The other strategy was the harvesting and probably the rain-cultivation of *Pennisetum* sp.

One may ask why the Shaqadud cave occupants choose to exploit millet and not sorghum since this area lies within the same belt of naturally growing stands of both species? This question becomes more important if we compare this site with the Neolithic sites on the east bank of the river Nile, *i.e.* within the natural habitat for both millet and sorghum; but here mainly sorghum was cultivated. Are these differences attributable to cultural preferences or were there some other reasons?

The answer to these questions is largely related to geomorphic and climatic conditions. Geomorphologically speaking, although the Shaqadud area is part of the Butana clayey plains, it is predominantly characterized by flat lying conglomerates, eroded sandstone and sandy mudstone which are ecologically well suited for the growth of millet rather than sorghum. In terms of climatic conditions, by the time of the occupation of the Shaqadud cave site, the climate had already started to get drier (Wickens 1975; 1982). The estimated annual rainfall was thus far below the requirements for the growth of sorghum, but fair enough for the growth of millet which is much more drought resistant than sorghum.

As regards the floral remains recovered from the sites situated within the same Sahel zone, some 325 kilometres east of Shaqadud, a variety of species were found either as carbonized remains or as impressions on pottery. These include one fragmentary sample of *Hordeum* sp. and many fruit stones of *Zizyphus* sp. found at the site of Kassala I and II (Constantini *et al.* 1982: 23). In addition to these, several impressions of domestic sorghum *S. bicolor* and *Setaria* sp. (identified from cavities in burnt clay) were recovered from the sites of Jebel Abu Gamal and Shurab el-Gash (Constantini *et al.* 1983: 18).

Evidence of barley *Hordeum* sp. from the site of Kassala I and II (Constantini *et al.* 1982: 23) poses a number of questions:

1. Was this cereal locally available or brought from somewhere else?

2. If barley was locally growing and if the evidence is that this area at that time was (as still is) a typical savannah with summer rains, warm winters and hot summers, how can we explain the basic difference between the habitat of this area and that required for the growth of barley (Stemler 1980: 507 - 508)?

3. On the other hand, if we assume that barley was imported, then where could it have come from? Again, if it was imported, one would also expect to find the evidence of other imported material culture that might indicate its origin(s). Is there any such evidence?

4. Apart from the questions of obstacles to transport and/or to communicate between the east of central Sudan and Egypt (Trigger 1965), the latter being the nearest area where barley was naturally growing and from which the earliest evidence of domesticated barley *ca* 4,000 B.C. was found (Stemler 1980), another question arises: why would the occupants of this area have gone in quest of barley when they had stands of naturally growing sorghum? Until more information is provided,

the presence of barley in this area at *ca* 2,000 B.C. will remain questionable. It is not unexpected, however, to find sorghum in this area since it is part of the initial belt of naturally growing sorghum (Harlan 1977: 473); but it is interesting that the species belong to domesticated sorghum dated to the 2nd millennium B.C. Thus they represent the earliest evidence so far of domesticated sorghum in the Sudan and in the initial belt where the earliest race (*S. bicolor*) was thought to be domesticated (Harlan 1977: 375). At the present state of our knowledge there is no similar evidence for this *S. bicolor* from anywhere else in the sorghum belt before 3rd century A.D. (Clark and Stemler 1975). Gathering wild plants such as the fruits of *Zizyphus* is also in evidence from this area.

Since there is no evidence from any of the excavated sites for specialized cultivation tools, it is only possible to speculate about what tools could have been used for cultivation. Comparative ethnographic material from West Africa shows that many of the cultivation tools used there are actually abandoned after the work is finished (Alexander 1969: 124 - 125). Furthermore, the Zaghawa, of west Sudan-east Chad, mostly use branches as harvesting tools (Tubiana and Tubiana 1977: 13 - 25). We cannot consider food processing tools such as grinders and pottery as indicators for cultivation and/or domestication of plants because these tools were also used by food-plant gatherers. It is only possible to associate these with plant domestication if we have evidence of domesticated species in the same context. It is only at the sites of JAG 1 and SEG 9 that we have this combination of both direct and indirect cultural evidence consisting of grinders, pottery and domesticated sorghum.

In summary, the results obtained in our survey of archaeoethnobotanical data from the Eastern Sahel (Sudan) are adequate only to suggest the following:

1. Despite the fact that this area is extended east – west within the same geographical zone, there appears to have been a wide range of adaptive strategies related to plant exploitation; these differed from site to site and from one period to another. These differences in strategies are most likely attributable to the following: a) differences in the physical environment and the landforms; b) progressively accelerating desiccation.

2. Based on the above mentioned (but leaving aside the chronology of the sites) it seems that the occupants of this part of the Sahel zone were quite knowledgeable about their local environments and the options they had as regards the food resources (both fauna and flora) available: these options ranged from hunting, fishing, gathering and exploiting the domesticated animals supplemented by small-scale seasonal cultivation to intensive cultivation and animal and plant domestication.

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