4,500-YEAR-OLD PLANT REMAINS FROM EGYPTIAN NUBIA

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Of the plant remains recovered from an excavation of terraces of the Nile at Afyeh, Egyptian Nubia, cereals, large seeds and rhizomes are reported here. Among the cereals there were both *Triticum* (wheat) and *Hordeum* (barley). The wheat was of two types—both naked and glumed. The naked wheat belongs to *T. aestivum* (L.) em. Thell., which according to the latest classification includes the present-day species *T. vulgare* (Vill.) Host. Mackey, *T. compactum* (Host.) Mackey and *T. sphaerococcum* (Perc.) Mackey. The other, i.e. glume wheat, has been placed under *T. dicoccum* Schubl. On the other hand, the barley belongs to six-rowed hulled *Hordeum, H. vulgare* L. Legume seeds have shown greatest resemblance to *Acacia nilotica* L. Syn. *A. arabica* Willd—a plant still growing in that part of Egypt. The rhizomes recovered could not be matched with any rhizome of the Gramineae, known to us, but there was some resemblance with *Desmostachya bipinnata* (L.) Stapf in Dyer. Significance of this find is discussed in some detail, in relation to earlier finds discovered in West Asia and Egypt.

INTRODUCTION

In 1962, Mr. B. B. Lal, Director-General of Archaeology in India, carried out an excavation at Afyeh, on the west bank of the Nile, 15 kilometres north of Anieba, the headquarters of the Egyptian Nubia. This was done under the auspices of UNESCO, which had appealed to all nations to help Egypt to preserve the heritage of thousands of years in the Nile Valley, before the construction of the High Aswan Dam was taken on hand. The materials collected included some charred plant remains which were handed over to the senior author in 1966 for investigation. The exact site of the collection was from a "level ground adjacent outside a house" (Ghosh 1964). A preliminary examination by archaeologists revealed wheat, barley, lentils and peas, etc. On re-examination we, however, recovered a mixture of wheat, barley, leguminous seeds, rhizomes, cotton seeds and animal dung. The last two items have already been reported elsewhere (Chowdhury and Buth 1970, 1971), and the rest of the plant material will be dealt with here.

The age of the site, determined by C^{14} method, is 2600–2400 B.C. (Ghosh 1964). According to the Egyptian archaeologists, the site was inhabited by 'A-Group' people, who were in a stage of rural economy and were engaged in the domestication of animals and plants.

METHOD OF STUDY

The state of deterioration of each and every plant-remain determined the technique that had to be applied to bring out detailed anatomical structure. For wheat and barley, peel method was the best. Here use of celloidin gave satisfactory results in some cases but not in all. In the latter case, Artschwager's method (1930) with slight modifications was found helpful. Section cutting of the caryopses was not of much use except confirmation of depth of groove observed under low, power microscope. Legume seeds were embedded in celloidin-paraffin according to the method used by Chowdhury and Ghosh (1954–1955) and gave satisfactory results. For rhizome, section cutting and Artschwager's peel methods were used (Chamberlain 1932; Johansen 1940).

Results

Cereals

Majority of the charred plant-remains consisted of fruits or caryopses, typical of the family Gramineae. They were about 1000 in number, of which only 373 were complete and the rest broken pieces. On macroscopic examination, these caryopses turned to be a mixture of more than one type, showing marked difference in shape, size and also in morphological characters. They have, therefore been grouped under two lots, 'A' and 'B'. The caryopses under lot 'A' were 30 in number, whereas those in lot 'B' 343. The results of their study are given below.

Lot A — Out of 30 caryopses, 20 are oval to subglobular in shape (Fig. 2), varying in length from 5 to 6.5 mm and in breadth 3.5 to 4.5 mm. These caryopses are rather plump, when viewed from the ventral side.

Remaining 10 caryopses are rather long and thin with somewhat pointed ends (Fig. 1). They vary in length from 6 to 7 mm. and in breadth from 2.5 to 3 mm. Some of the caryopses have a part of rachis attached to them. The two cheeks of the grains are narrow and flat, when examined on the ventral side. Amongst these caryopses, some spikelet fragments (Fig. 4) have also been detected. It shows presence of two small bases of glumes on either side of the node. There is also a small, raised portion in the centre between the remnants of glumes, indicating the place of attachment of caryopsis. The position of the embryo is at the base of the dorsal surface in all the caryopses. When closely examined, some of the caryopses are covered partially or completely by a thin covering that shows no structural peculiarity under microscope.

Anatomy—Attempts have then been made to match the structure of the thin layer of pericarp of the carbonized caryopses (Fig 7) with that of extant caryopses of *Triticum* species. The pericarp of extant wheat has two thin layers, both made up entirely of long parenchymatous cells. The only difference between the outer and the inner layer is that the former has numerous simple pits on its cell walls, while in the latter though pits are present, but they are scanty. Comparative study of the layer on the carbonized caryopses shows that it belongs to the inner layer. Apparently the outer layer of the pericarp has been destroyed during carbonization.

Serial sections of the caryopses do not reveal any useful anatomical data. After carbonization, the cells of the caryopses inside have been distorted. The black mass formed, shows little details of the structure of individual cells. The only preserved tissue is the endosperm and the remains of vascular tissue in the furrow. The furrow itself is rather deep and the lobes are fairly conspicuous. The unknown material shows great similarity in cross section to those cut from the extant caryopses of *Triticum* species.

In the absence of other morphological characters, the shape and size have proved useful in determining the archaeological wheat caryopses. There seems a gradual variation in both shape and size as one comes across diploid, tetraploid and hexaploid wheat. For example, the primitive wheats like *Triticum boeoticum*, *T. monococcum* (diploids), and *T. dicoccoides* and *T. dicoccum* (tetraploids) show long and thin, flat and pointed grains. The caryopses of hexaploid wheats are shorter, plumper and round to oval in shape. These characteristics are useful not only for the present-day wheats but also for the classification of ancient wheats (Helbaek 1960).

In the light of above morphological features, it seems necessary to point out the salient features of the Nubian material. Majority of the caryopses (Fig. 2) have neither glumes nor rachis segments. This means that they belong to the naked wheats. Since they are slightly short, comparatively plump, more or less round and considerably wider near the embryo, they would appear to belong to hexaploid group of the naked wheats (Table I). Hexaploid wheats have been classified recently by Mackey (1954) and Sears (1956). Taking Mackey's classification, the species *Triticum aestivum* (L.) em. Thell. includes subspecies *T. spelta* (L.) Thell., *T. macha* (Dek and Men.) Mackey, *T. vavilovii* (Tuman.) Sears, *T. vulgare* (Vill.) Host. Mackey, *T. compactum* (Host.) Mackey, and *T. sphaerococcum* (Perc.) Mackey. While working on archaeological material of naked wheats, Helbaek (1966 *a*, *b*, *c*, 1969) has put only *T. vulgare*, *T. compactum* and *T. sphaerococcum* under *T. aestivum*. The data on Nubian material that have been available to us hardly justify one to go on to subspecies either as suggested by Mackey or by Helbaek. The Nubian naked wheat is therefore placed under *Triticum aestivum* (L.) em. Thell.

TABLE I

Triticum (*After Helbaek* 1960)

	Diploid (2×7)	Tetraploid (4×7)	Hexaploid (6×7)
Wild forms	*T. boeoticum* Boiss. em. Schiem. (=*T. aegilopoides* Bal.)	*T. dicoccoides* Korn.	
Glume wheats	*T. monococcum* L. (Einkorn)	*T. dicoccum* Schubl. (Emmer)	*T. spelta* L. (Spelt)
Naked wheats		*T. durum* Desf. (Hard wheat)	*T. vulgare* (Vill.) Host. (=*T. aestivum* L.) (Bread wheat)
		T. turgidum L. (Rivet wheat, etc.)	*T. compactum* Host. (Club wheat)
			T. sphaerococcum Perc. (Dwarf wheat, etc.)

As mentioned earlier, the Nubian wheat caryopses also contain a few kernels which are conspicuously different from the lot just described, in having sharp ends and less plump cheeks (Fig. 1). In addition, this lot shows rachis attached to the caryopsis and forked based attachment (Fig. 4). These characters are usually confined to glume wheats. The glume wheats include the following species namely *T. monococcum* (Einkorn), *T. dicoccum* (Emmer), *T. dicoccoides* (wild emmer) and *T. spelta* (Spelt). All these have characteristic feature "woody, roughly fork-shaped base or the solid base of the glume" (Helbaek 1952, 1964 *a, b, c*; Tables 1, 2). Now, this Nubian wheat shows characteristic features of the four species mentioned above. Out of these four, *T. spelta* can be taken out from the rest on its characteristic mode of fracture of rachis. The remaining two species namely *T. monococcum* and *T. dicoccum* both cultivated show great similarity to the unknown. Mention must be made here of the possibility of the unknown being *T. dicoccoides* which is known as wild emmer. It is not possible at this stage to say more than this, that the Nubian long wheat is either *T. monococcum* L., or *T. dicoccum* Schubl. or *T. dicoccoides* korn. (For further clarification, *see* discussion).

Lot B — Consists of 343 caryopses, of which only 40 are entire (Fig. 3). They vary in length from 6 to 10 mm and in breadth 2.5 to 3.5 mm. Majority of the caryopses have a distinct bulge in the centre. They are flat on the dorsal side and the ventral furrow is shallow. The embryo has a pointed beak. One of the bulged caryopsis shows bristles in the furrow between two cheeks (Fig. 6).

All the caryopses are enclosed in a thick covering which shows characteristic longitudinal ridges, when seen under binocular microscope. Part of the floret axis shows three seats of caryopses after detachment (Fig. 5).

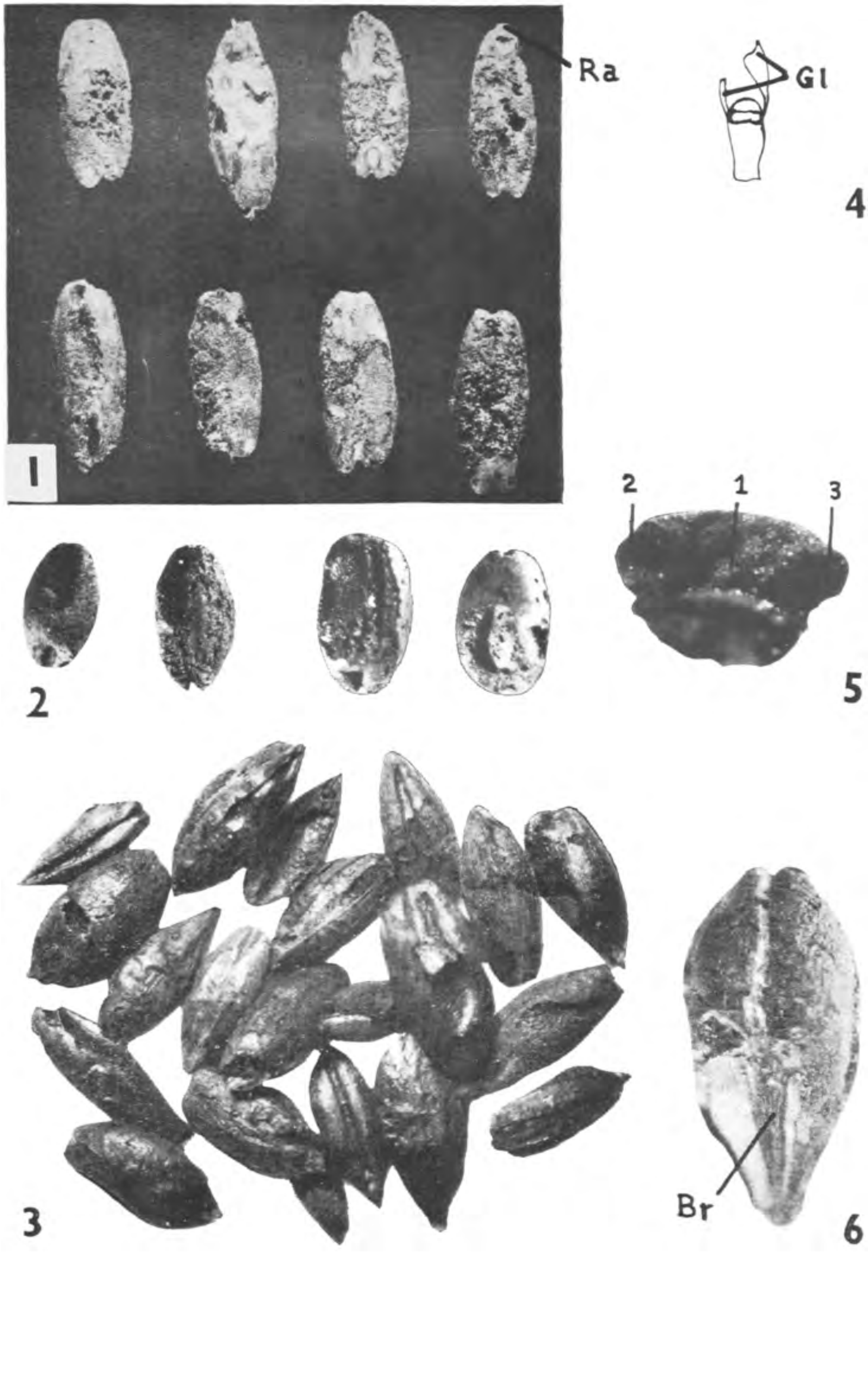
Anatomy—For the anatomical detail, section cutting has not proved of much help. Peel method was applied with considerable variation with each and every piece of the material. The data obtained are given below :—

Peels from the outer covering show presence of long and short cells (Fig. 9). The long cells have very thick and sinuous walls which contain pits. The short cells are single or in pairs, often showing crescent-shaped silica bodies. The anatomical structure of the thick covering (husk) which is a combination of lemma and palea, shows great similarity to those of the extant hulled *Hordeum* species (Fig. 10).

Under binocular microscope, some pieces of what looked like stem, have been recovered. From their look, it has been impossible to say whether these pieces belong to wheat or barley. Peels of the pieces show that the epidermal layer is made up of long cells. Some of these cells have sinuous walls while others have straight walls. The short cells are also present, single or in pairs. Each pair is represented by cork and silica cells; the latter are round or vertically elongated. Stomata are present but scanty, usually in a single row. Walls of the subsidiary cells are usually flat, rarely low domed. From this, it will be seen that these plant remains from Nubia belong to *Hordeum* species (Chowdhury 1963).

FIGS. 1-6. 1, caryopses showing remnants of rachis. × 4 ; 2, caryopses without rachis. × 3. (compare shape and size of Figs 1 and 2) ; 3, caryopses. × 4 [note outer surface of husk (lemma-palea)]; 4, spiklet showing remnants of glumes. × 4; 5, floral axis showing three seats of caryopses. × 5 ; 6, showing bristles in the furrow. × 7. (Figs 1, 2 and 4 are from lot *A*, while Figs 3, 5 and 6 are from lot *B*)

(*Ra*, rachis; *Gl*, glume; *Br*, bristle)


Ra
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As mentioned earlier, serial sections of caryopses cut from the Nubian material show nothing but black mass of tissues. However, the shallow furrow, the low-domed lobes and remains of vascular tissue show considerable similarity to that of the living *Hordeum* species.

Genus *Hordeum* has been classified into two main groups on the number of fertile florets present per node (Bor 1960; Helbaek 1960; Backer and Bakhuizen 1968 Table II). The two groups are, the two-rowed barley and the six-rowed barley. In two-rowed species, there are three florets per node, only median floret develops into a fruit, the two lateral florets are sterile. Thus, there is only one row of caryopsis on either side of the spike. In six-rowed species, all of the three florets are fertile, resulting three caryopses on either side of the spike. The median caryopsis of six-rowed barley usually has a distinct bulge in the middle while the lateral caryopses show a prominent twist on the ventral side.

TABLE II

Genus Hordeum (*After Helbaek* 1960)

Wild two-row, hulled
(*H. spontaneum* Koch.)

↓

Cultivated two-row, hulled and naked
(*H. distichum* L.)

↓	↓
Cultivated six-row, lax-eared, hulled and naked *H. vulgare* L. (=*H. tetrastichum* Kcke.)	Cultivated six-row, dense-eared, hulled and naked (*H. hexastichum* L.)

From the description of the Nubian material given earlier, it will be seen that these caryopses possess a thick covering enclosing well bulged kernel, and the base of the floral axis persists showing the seats of 3 caryopses. This means that the Nubian *Hordeum* belongs to hulled form of six-rowed species.

Furthermore, stem like pieces reported earlier, have revealed the minute anatomical structure similar to those found in the *Hordeum* species. Now, the *Hordeum* species have been classified by Chowdhury (1963, Table III). This shows that the Nubian *Hordeum* exhibits greatest similarily to *Hordeum vulgare* L. both morphologically and anatomically.

Leguminous seeds

There are a few seeds distinctly different from the cereals. Some of them are large and uniformly-shaped, with smooth and thick seed coat (Fig. 11*a*). The others are angular in shape with thin seed coat. Some of the large ones are found to have sprouted before they were charred.

The outer layer of thick seed coat shows macrosclereids of Reeve (1946) or palisade cells of Corner (1951). There is a suggestion of cuticle outside the palisade cells. The palisade cells (Fig. 12) are very thick-walled with narrow lumen and

TABLE III

Stem epidermal cells of Hordeum *spp.* (*After Chowdhury* 1963)

Species	Stomata		Short Cells	
	Distribution of stomata	Outer wall of subsidiary cells of stomata	Short cells	Silica cells
Hordeum vulgare	Rather scanty; mostly in single row, occasionally in rows of 2	Mostly parallel, rarely domed	Mostly single	Vertically elongated, rather scanty
H. vulgare EB. 642	Very scanty; in single row	Mostly parallel	Mostly in pairs, when single, horizontally elongated	Both vertically and horizontally elongated
H. vulgare EB. 648	Rather scanty; mostly in single row, occasionally in rows of 2	Mostly parallel	About 50 per cent single, 50 per cent in pairs	Both vertically and horizontally elongated
H. agricrithom	Rather frequent; mostly in rows of 2-3, occasionally in single row	Parallel in almost all	Single and in pairs in almost equal number	Both vertically and horizontally elongated
H. vulgare afghana	Fairly abundnt in rows of 2-3	Slightly domed, rarely parallel	About 50 per cent single, 50 percent in pairs	Fairly abundent vertically elongated
Nubian sample Lot 'B'	Rather scanty, mostly in single row	Mostly parallel	Mostly single	Vertically elongated, rather scanty

arranged in a columnar fashion. The next layer is made up of comparatively small cells which are slightly waisted (Fig. 12). These cells are therefore hour-glass cells, and often show uniform intercellular spaces. Below this is the thick-walled mesophyll tissue.

Corner (1951) has pointed out that any microscopic structure of seed coat that shows the external palisade and the hour-glass cells below it, is "apparently identifiable as leguminous." The large seeds from Nubia have both these features and therefore belong to Leguminosae. The family Leguminosae has been divided into three subfamilies based on their seed coat anatomy (Corner 1951). Musil (1963) has also divided the family based on the morphology of seeds. According to her the papilionaceous seeds can be easily distinguished from those of Mimosoid-Caesalpinioideae. The characteristic feature of the former is that the hilum is conspicuous and can be easily seen over the seed coat, while in the latter, the hilum is suppressed and not easily distinguishable. Based on both anatomy and morphology of seeds, the Nubian large seeds are identified as belonging to Mimosoideae-Caesalpinioideae of the Leguminosae. To find out the genus and species to which the seeds are related, additional morphological features have to be taken into consideration. There is a clear and distinct marking running more or less parallel to the outline of seed (Fig 11a). This characteristic is confined to the seeds of *Acacia* (Martin and Barkley 1961). A comparative study of different *Acacia* seeds shows that there is greatest similarity between the unknown seed and seeds of *Acacia nilotica* L. Del. Syn. *Acacia arabica* Willd. (Fig 11*b*). A reference to the Acacias growing in the Nile valley reveals that this tree is frequently found in that part of Egypt.

The seeds with thin seed coat show neither palisade cells nor hour-glass cells. Their anatomical structure is rather confusing. It has, therefore, not been possible to identify any one of them.

Rhizomes

In addition to what has been reported earlier, there are a few plant remains entirely different from the rest. These materials are also completely charred. Altogether there are about 25 pieces.

Morphology—In length they vary 5 to 12 mm and in diameter 2 to 3 mm. They are irregular in shape and show prominent nodes and internodes. Some nodes also show circular scars on them. Some scars appear to have remnants of base of leaves or sheaths (Figs. 14, 15).

Anatomy—Peels taken out from the epidermis show typical monocotyledonous structure. There are long and short cells. The long cells have sinuous wall, and the short cells occur in groups of 2 to 3. The silica body in short cells shows irregular shape.

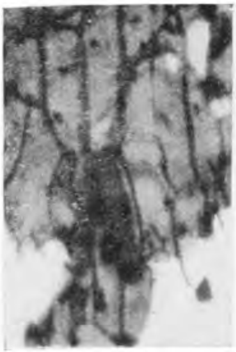
Cross sections (Fig 16, 17) show two clearly demarcated ground tissues—the outer and the inner, separated by an almost complete band of sclerenchymatous cells (Fig 16). Metcalfe (1960) mentions of such a sclerenchymatous band in some members of Gramineae and gives some drawings in his book. But, none of his drawings shows any similarity to the general structure that the Nubian material gives. Suspecting that the ancient rhizomes might be from a grass that grows in desert areas, a fairly large number of grass rhizomes were collected from semi-desert localities round about Aligarh. Of these, one, namely *Desmostachya bipinnata* (L.) Stapf in Dyer (Bor 1960), has shown some similarity with the unknown in gross structure (Fig 18) but in minute details, there are differences. In such circumstances, it seems advisable to say only this that the ancient rhizomes belong to one of the grasses that grow in Egyptian Nubia.

Discussion

Examination of the archaeological remains from Nubia has thrown some light on the way of life of the people who lived there. They were 'A-Group' people,

FIGS. 7–13. 7, caryopsis peel showing cells of inner layer of pericarp (*Lot A*). × 300 ; 8, peel from fresh *Triticum vulgare* caryopsis inner side (compare with Fig 7). × 300 ; 9, caryopsis peel showing long- and short cells (*Lot B*). × 300 ; 10, peel from fresh *Hordeum vulgare* caryopsis (compare with Fig 9). × 300 ; 11, (a) archaeological and (b) fresh seeds of *Acacia nilotica* (note similarity in general look). × 6 ; 12, cross-section of seed coat of 11 (a) showing hour-glass cells. × 600 ; 13, cross-section of seed coat of 11 (b). × 450.

(*Sc*, short cell ; *Lc*, long cell ; *Pal*, palisade ; *Hgl*, hour-glass cell ; *Mes*, mesophyll)



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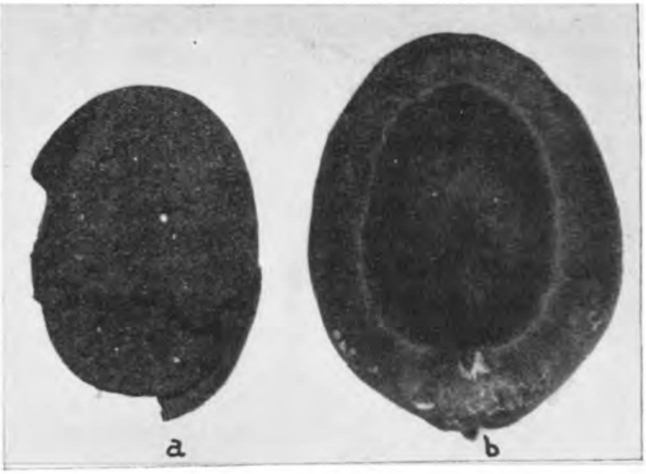

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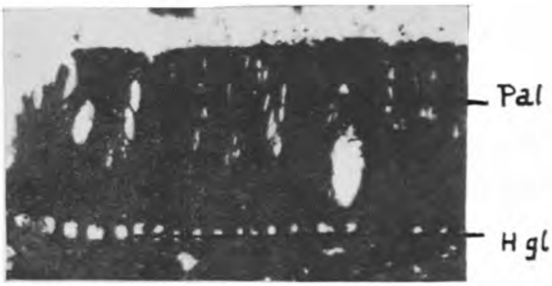

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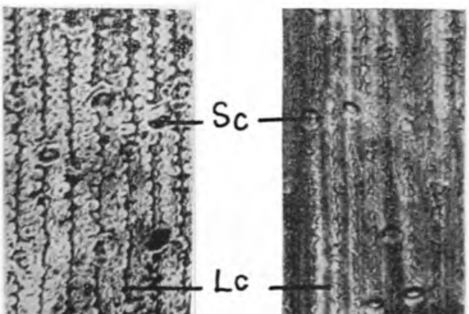

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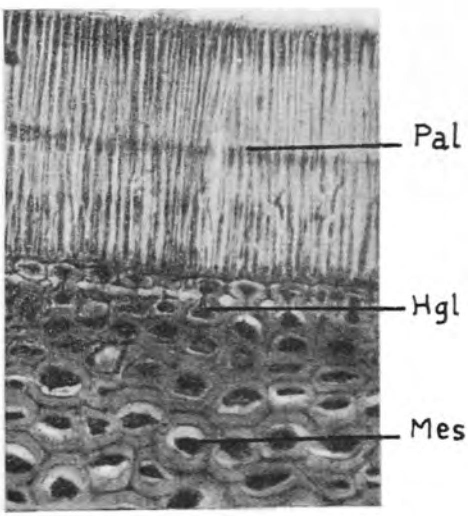

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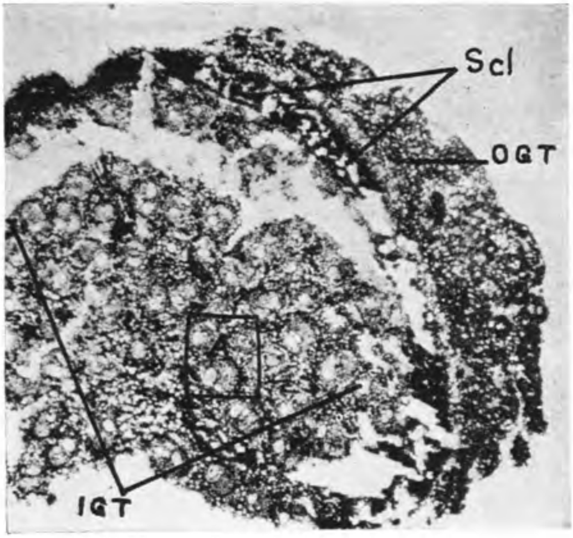

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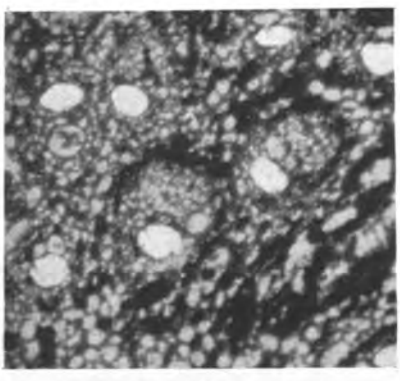

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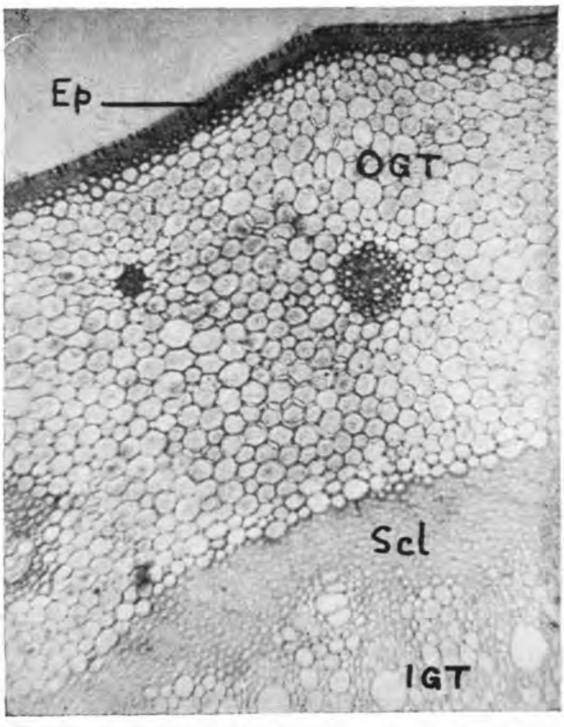

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who can roughly be said to belong to pre-Dynastic to early Dynastic age of Egypt. Carbon^{14} determination has given the age as 2600-2400 B.C. (Ghosh 1964). The rural economy established by the inhabitants (Baumgartel 1955) indicates that they had made considerable progress in the domestication of plants and animals. They lived in houses with one-leaf door and used chert blade sickles to reap crop and mullers for grinding cereals. Chisel of copper indicates the Neolithic stages of their culture. There are also signs that they had begun to use ornaments made of stones.

The plant remains from Nubia were at first reported to contain "wheat, barley, lentil, gram, peas etc.", and were thought to have been temporarily stacked outside a house (Ghosh 1964). Re-examination has, however, revealed an entirely different picture. No doubt, there were barley and wheat but there was neither lentil nor gram nor peas. Among the new finds, there were non-edible leguminous seeds, cotton seeds, rhizomes and animal excreta.

A mixture of wheat, barley, seeds of non-edible legume, and seeds of cotton along with rhizomes and excreta, raises the question for what purpose were they used ? If only cereals and edible legumes were found, it could have been inferred that these were meant for human consumption. Presence of cotton seeds and rhizomes leads one to think that these remains were meant for feeding animals. Actual remains of goat and sheep dung mixed with plant remains, give additional support to this view. It may, therefore, be concluded that these plant remains were sweepings from a house or a shelter which was used for tethering goats and sheep.

Each plant remain will now be considered separately to show what archaeological or botanical significance it conveys.

Cereals

The cereals contain barley and wheat. The proportion between barley and wheat is 12:1. Unless there has been a serious defect in our method of sampling, which is not likely, the proportion of these cereals has some significance. It is possible that barley was cultivated more in abundance than wheat. It is also possible that even at that time wheat was preferred to barley for human consumption. This leeds one to think that barley would have been used in a larger quantity as animal food than wheat. The present study does not allow us to say definitely which of these two alternatives was the case. Further study of food habit of the Nubians 4,500 years ago, will only reveal the exact condition in existence at that time.

Triticum (wheat)—At this stage, it will be desirable to find out whether or not Nubian *Triticum* shows any relation with the ancient *Triticum* so far recovered from the pre-historic sites of West Asia and Egypt (Table IV, Fig. 19). The earliest naked wheat is from Tell Ramad (7000 B.C.) and has been definitely identified as *Triticum compactum* Host. which, according to the latest classification, is a subspecies of *T. aestivum* L. em. Thell. Then from Catal Huyuk in Anatolia (5800-5600 B.C.), there is bread wheat *T. aestivum* L. The same species was reported from

FIGS. 14–18. 14, rhizome-like pieces from Nubia. × 2 ; 15, a single rhizome showing nodes and internodes. × 6 ; 16, cross-section of Nubian material (note two ground tissues separated by a band of sclerenchymatous cells). × 200 ; 17, higher magnification of *A* in Fig 16. × 600 ; 18, cross-section of *Desmostachya bipinnata* rhizome. (compare with Fig 16). × 600.
(*Scl*, sclerenchyma cells ; *Ogt*, outer ground tissue ; *Igt*, inner ground tissue ; *Ep*, epidermis.)

TABLE IV

Triticum (*wheat*) *of yrimary agricultural settlements in Western Asia and Egypt* (*After Renfrew* 1969*)

Site, region or country	Age	Species	Remarks
Tell Mureybat (On bank of Euphrates, Northern Syria)	8050–7542 B.C.	*T. boeoticum* Boiss. em. Schiem. (=*T. aegilopoides* Bal.)	wild
Bus Mordeh Phase (Alikosh, Iranian Khuzistan)	7500–6750 B.C.	*T. boeoticum* Boiss.em. em. Schiem.	wild
		T. monococcum L.	glume wheat
		T. dicoccum Schubl.	–do–
Aceramic Hacilar (West Central Anatolia, Turkey)	7000 B.C.	*T. boeoticum* Boiss. em. Schiem.	wild
		T. dicoccum Schubl.	glume wheat
Tell Ramad (Syria)	*C.* 7000 B.C.	*T. monococcum* L.	–do–
		T. dicoccum Schubl.	–do–
		T. compactum Host.	naked wheat
Beidha (Southern Jordan)	*C.* 7000 B.C.	*T. dicoccum* Schubl.	glume wheat
Jericho (Jordan Valley)	*C.* 7000 B.C.	*T. monococcum* L.	–do–
		T. dicoccum Schubl.	–do–
Jarmo (Iraqi kurdistan)	6750 B.C.	*T. aegilopoides* Bal.	wild
		T. monococcum L.	glume wheat
		T. dicoccoides Korn.	wild
		T. dicoccum Schubl.	glume wheat
Alikosh Phase (Iranian Khuzistan) Iran	6750–5500 B.C.	*T. dicoccum* Schubl.	–do–
Mohammad Jaffar Phase (Alikosh, Iranian Khuzistan)	6000–5500 B.C.	*Triticum dicoccum* Schubl.	–do–
Catal Huyuk (Anatolia, Turkey)	5800—5600 B.C.	*T. monococcum* L.	glume wheat
		T. dicoccum Schubl.	–do–
		T. aestivum L. em. Thell. [=*T. vulgare* (Vill.) Host.]	naked wheat
Ceramic Hacilar (Anatolia, Turkey)	5800—5000 B.C.	*T. monococcum* L.	glume wheat
		T. dicoccum Schubl.	–do–
		T. aestivum L. em. Thell.	naked wheat
Tell es Sawwan (On the Middle of Tigris in Iraq)	5800—5600 B.C.	*T. monococcum* L.	glume wheat
		T. dicoccum Schubl.	–do–
		T. aestivum L.	naked wheat
Matarrah (Kurdish Uplands)	*C* 5750 B.C.	*T. dicoccum* Schubl.	glume wheat
Amuq (Plain of Antioch Syria)	*C* 5750 B.C	*T. dicoccum* Schubl.	–do–
Can Hasan, Late Neolithic (Anatolia, Turkey)	*C* 5250 B.C.	*T. dicoccum* Schubl.	–do–

Fayum (Egypt)	5th millennium B.C.	*T. dicoccum* Schubl.	–do–
Merimdah Beni Salame (Egypt)	5th millennium B.C	*T. dicoccum* Schubl. *T. compactum* Host.	–do– naked wheat
El Omari (Egypt)	4th millennium B.C.	*T. dicoccum* Schubl. *T. compactum* Host.	glume wheat naked wheat
Early dynastic tombs (Egypt)	3rd millennium B.C.	*T. dicoccum* Schubl. *T. aestivum* L. em. Thell	glume wheat naked wheat
Nubian sample	*C*. 2500 B.C	*T. diccocum*	glume wheat

Hacilar (5800-5600 B.C.). Further east this very species was found at Tell es Sawwan (5800-5600 B.C.). Archaeological evidence available at present shows that bread wheat (*T. aestivum*) arose in the Near East, Anatolia and South Europe and that by 5000 B.C. it became an established domestic crop (Helbaek1966; *a*, *b*, *c* Renfrew 1966).

As far as Egypt is concerned, the oldest wheat is from Merimda Beni Salame (5000 B.C.). It was club wheat (*T. compactum*). There is also record of *T. compactum* from Fayum (5000 B.C.) and from el Omari (4000 B.C.). After this, surprisingly there is so far no record of this wheat till the first millenium B.C. The reason for this gap has not so far been available. The Nubian naked wheat (2500 B.C.) which looks a great deal like *T. compactum* Host., and may be actually so, would supply evidence for partially filling up the gap. In case it is not *T. compactum*, it will be either the subspecies *T. vulgare* (Vill.) host. Mackey or *T. sphaerococcum* (Perc.) Mackey. In that case the Nubian material will be a new record for South Egypt. How it came there will, however, remain an open question for some time to come.

As regards the past record of the glume wheats in Western Asia and Egypt, it appears that when man began to use wheat for food, it was the wild wheat (*T. boeoticum* Boiss. em. Schiem. (*T. aegilopoides* Bal.) (Renfrew 1969, Table IV). This was discovered at Tell Mureybat in Northern Syria (8050–7542 B.C.). From the finds at Bus Mordeh phase (Alikosh), Aceramic Hacilar (Anatolia) and Beidha (Southern Jordon), it is clear that the two domesticated species namely, *T. monococcum* L. and *T. dicoccum* Schubl. made their appearance in the seventh millennium B.C. (Table IV). Subsequent findings reveal that emmer (*T. dicoccum*) became the main crop in the whole range of West Asia. As regards einkorn (*T. monococcum*), it was a minor crop, growing generally on a smaller scale than emmer, and often according to helbaek (1959) was merely a contaminant of emmer. On spelt wheat (*T. spelta* L.) Helbaek (1966) holds the view that it "never occurred in prehistoric West Asia and even in Europe, which seems to be its area of origin (as a cultivar at least); it is rather a new commer". After critically examining all the archaeological samples of wheats, kept in the various museums in Egypt, Helbaek is sceptical about the presence of *T. monococcum* in pre-historic and early dynastic Egypt. On the other hand, occurrence of *T. dicoccum* dates back in Egypt from predynastic age to present time. It will, therefore, be seen that, from archaeological evidence available at present, there is every likelihood that the Nubian glume wheat is emmer (*T. dicoccum* Schubl.).

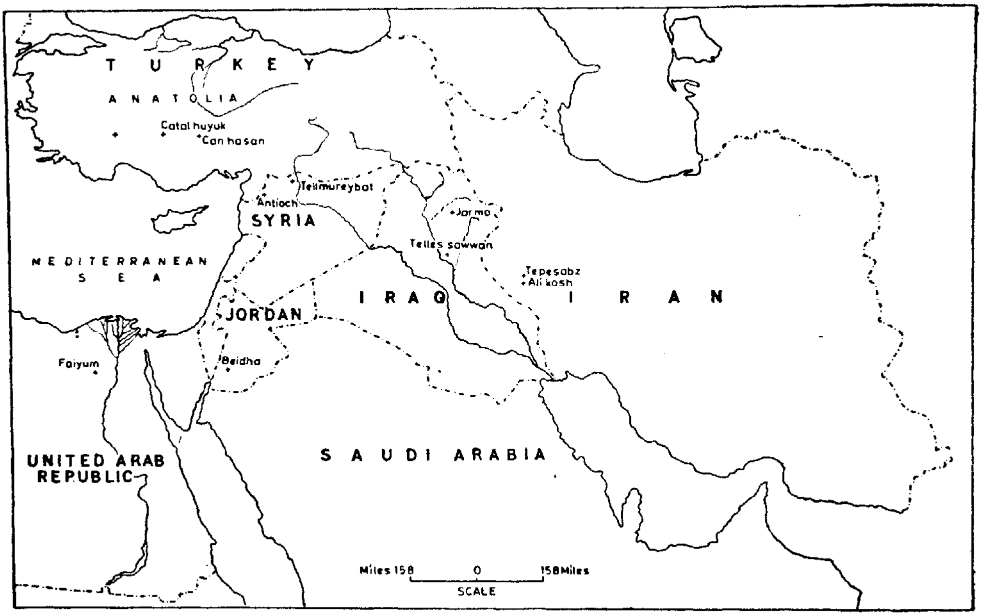

FIG. 19. Earlier excavated sites in West Asia and Egypt where wheat and barley have been found.

Hordeum (Barley)—Now to find out relation, if any, between Nubian *Hordeum* and the *Hordeum* remains that have so far been reported from West Asia and Egypt (Table V, Fig 19), leads to a review of the present knowledge on the evolution of *Hordeum*, so far revealed by the study of archaeological materials. The earliest barley used by man appears to be two-row *Hordeum spontaneum* Koch. This was a wild variety, hulled, found at Tell Mureybat (8050–7542 B. C.). It continued to be found at Beidha (7000 B.C.) in South Jordon. Again, at Tell Ramad (7000 B. C.) in Syria, *H. distichum* L.—a two-rowed, hulled, domesticated barley—has been recorded for the first time (Renfrew 1969, Table V). Then on, the barley finds from West Asia do not give any clear information as to when each species originated and how each species was related to one another in their evolution. What the data reveal is that *H. spontaneum* Koch., *Hordeum distichum* L., *H. vulgare nudum* L. and *H. vulgare* L. were cultivated, often as a mixture of two to three. This state continued for over 1500 years, from 6750 B.C. to 5000 B.C. (Table V).

According to Helbaek (1960) barley was introduced in Egypt in the fifth millennium B. C. This early find showed considerable diversity which lead him to conclude that the species was "in a state of vigorous mutation in consequence of its fairly recent introduction into Nile Valley". By the time of third millennium B.C. six-row, hulled barley seems to have been well established in this area (Table V). The Nubian sample (2500 B. C.) has proved to be six-row, hulled *H. vulgare* L. It will therefore be seen that the Nubian find fits with the results of earlier investigations on six-row barley which have been so far collected from various sites in Egypt.

TABLE V

Hordium (Barley) of primary agricultural settlements in West Asia and Egypt
(After Renfrew 1969*)

Site, region or country	Age	Species	Remarks
Tell Mureybat (On bank of Euphrates, North Syria)	8050–7542 B.C.	*H. spontaneum* Koch.	wild, two-row, hulled
Alikosh, Bus Mordeh Phase (Iranian Khuzistan)	7500–6750 B.C.	*H. spontaneum* Koch.	–do–
Beidha (South Jordan)	*C.* 7000 B.C.	*H. spontaneum* Koch.	–do–
Tell Ramad (Syria)	*C.* 7000 B.C.	*H. distichum* L.	two-row, hulled
Jericho (Jordan Valley Pre-Pottery Neolithic)	*C.* 7000 B.C.	*H. distichum* L.	–do–
Aceramic Hacilar (Anatolia, Turkey)	7000 B.C.	*H. vulgare-nudum* L.	six-row, naked
Jarmo (Iraq)	6750 B.C.	*H. spontaneum* Koch.	wild, two-row, hulled
Alikosh Phase (Iran)	6750-6000 B.C.	*H. distichum* L. *H. vulgare* L.	two-row, hulled six-row, hulled
Tepe Guran (Luristan, Iran)	6200-5500 B.C.	*H. spontaneum* Koch.	wild, two-row, hulled
Mohammad Jaffar Phase (Alikosh, Iranian Khuzistan)	6000–5600 B.C.	*H. distichum* L.	two-row, hulled
Tell es Sawwan (On the Middle of Tigris in Iraq)	5800–5600 B.C.	*H. distichum* L. *H. vulgare-nudum* L. *H. vulgare* L.	two-row, hulled six-row, naked six-row, hulled
Ceramic Hacilar (Anatolia, Turkey)	5800–5000 B.C.	*H. distichum* L. *H. vulgare-nudum* L. *H. vulgare* L.	two-row, hulled six-row, naked six-row, hulled
Catal Huyuk (Anatolia, Turkey)	5850–5600 B.C.	*H. spontaneum* Koch. *H. vulgare-nudum* L.	wild, two-row, hulled six-row, naked
Mersin; Early Neolithic	*C.* 5750 B.C.	*H. vulgare* L.	six-row, hulled
Matarrah (Kurdish Uplands)	*C.* 5750 B.C.	*H. distichum* L.	two-row,hulled
Tepe Sabz (Deh Luran, Iranian Khuzistan)	5500–5000 B.C.	*H. distichum* L. *H. vulgare* L.	two-row,hulled six-row,hulled
Can Hassn (Anatolia, Turkey)	5250 B.C.	*H. vulgare* L.	–do–
Fayum A (Egypt)	5th millennium B.C.	*H. distichum* L. (?) *H. vulgare* L.	— six-row,hulled
Fayum (Egypt)	3rd millennium B.C.	*H. vulgare* L.	–do–
Nubian sample (Egypt)	*C.* 2600–2400 B.C.	*H. vulgare* L.	–do–

Leguminous seeds

The Leguminous seeds are eaten both by men and animals. Men eat only those seeds which are not injurious to them. Some seeds contain harmful chemicals in their cotyledons and are injurious to men. The Leguminous seed recovered from Nubia has been identified as *Acacia nilotica* (L.) Del. Syn. *Acacia arabica* Willd. This is not eaten by men but used throughout its distribution as an animal feed. It grows wild in Egyptian Nubia and must have been collected locally for feeding goats and sheep.

Rhizomes

Use of rhizomes of some monocotyledons as animal fodder is evident from the plant remains at Afyeh. There is little doubt that this plant was available in the neighbourhood. If this plant is actually *Desmostachya bipinnata* (L.) Stapf in Dyer, then its fodder value is rather limited, although it is known to be used as fodder in Afghanistan "possibly because in such an arid country fodder of any kind, no matter how unpalatable, enables the stock to survive" (Bor 1960).

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