ARCHAEOBOTANICAL STUDIES IN THE LEVANT
3. LATE-PALAEOLITHIC MUREYBIT

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ABSTRACT: Excavations at Tell Mureybit, on the North Syrian Euphrates River, have been carried out by M.N. van Loon (1964, 1965) and J. Cauvin (1971-1974). Four main habitation phases, covering a time span from 8500-6900 B.C. (conventional radiocarbon years), are distinguished. The foundations of round as well as of rectilinear houses were unearthed. The chipped stone industry of the lower levels (subphase IA) is of Natufian tradition. Polished stone axes appear in phase IV. The faunal remains are all of wild animals. The present-day natural vegetation of the uplands in the Mureybit area is a steppe, whereas the Euphrates valley was naturally covered by poplar forest.

From the various habitation levels samples were secured for botanical examination. Information on the Mureybit charred seeds and fruits is presented in section 3 (figs. 5-9). Grains of two-seeded wild einkorn wheat (*Triticum boeoticum* ssp. *thaoudar*) occur in all levels and are quite numerous in phase III samples. Wild barley (*Hordeum spontaneum*) is also well represented. The size class of the lentil seeds corresponds to that of the wild species. The question is discussed whether the cereal grains were collected in the wild or whether already some kind of plant cultivation (proto-agriculture) was practised. The plant remains themselves provide no conclusive evidence in this respect. On the other hand, the vegetable remains and the animal bones point both to a change in the exploitation of food resources in phase III.

Marked differences in mean seed and fruit frequencies occur not only between habitation phases but between different areas of the site within one phase. Most of the plant taxa demonstrated for Mureybit could have formed part of the upland steppe. In addition, various species from the river-valley vegetation are represented. The latter must have been of considerable economic importance because of the wood (poplar, tamarisk). It is impossible to determine to what extent the steppe vegetation was exploited by the inhabitants of the site. *Pistacia* fruits must have been collected rather intensively.

KEYWORDS: Mureybit, late-Palaeolithic, wild einkorn wheat, wild barley, proto-agriculture, steppe environment, river-valley forest.

1. THE SITE AND ITS ENVIRONMENT

1.1. The environment

Before a large section of the North Syrian Euphrates Valley became flooded as a result of the construction of the barrage at Tabqa, the early village site of Mureybit was situated on the left bank of the river, near Meskene, about 85 km east of Aleppo (figs. 1 and 2). At present, only the top of the mound emerges above the waters of the Tabqa Dam Reservoir (Lake Assad). The base of the mound lies at about 285 m above sea-level. The uplands to the east and northeast of the site rise to elevations of over 500 m.

In North Syria, the Euphrates has cut a valley, 5-10 km wide, in a plateau which is composed of Miocene limestone capped by a layer, a few metres thick, of chert conglomerate. In the valley, alluvial sediments have been deposited by the river and the tributary wadis. In addition to the meandering stream channel, relict channels and low terraces occur in the flood plain. Maximum water levels are reached in April/May occasioned by the melting of the snow in the mountains of Anatolia where the Euphrates has its source. Lowest levels occur usually in September/October, at the end of the dry season. The above information is largely derived from Wilkinson (1978).

In the North Syrian plain a Mediterranean-type climate prevails. The estimated mean annual precipitation in the Mureybit area is 200 mm or slightly higher. The rainy season lasts from October to April. Mean January and July temperatures are about 7° and 30°C, respectively. Because of the considerable annual fluctuations, a mean annual rainfall of 200 mm is too low to rely on for dry-farming. Under favourable soil conditions, 200 mm precipitation evenly distributed over the winter months would be enough to grow barley and 250 mm to grow wheat, but too often rainfall is well below the annual average resulting in a crop failure if no extra water is provided by irrigation (Wirth, 1971: p. 92).

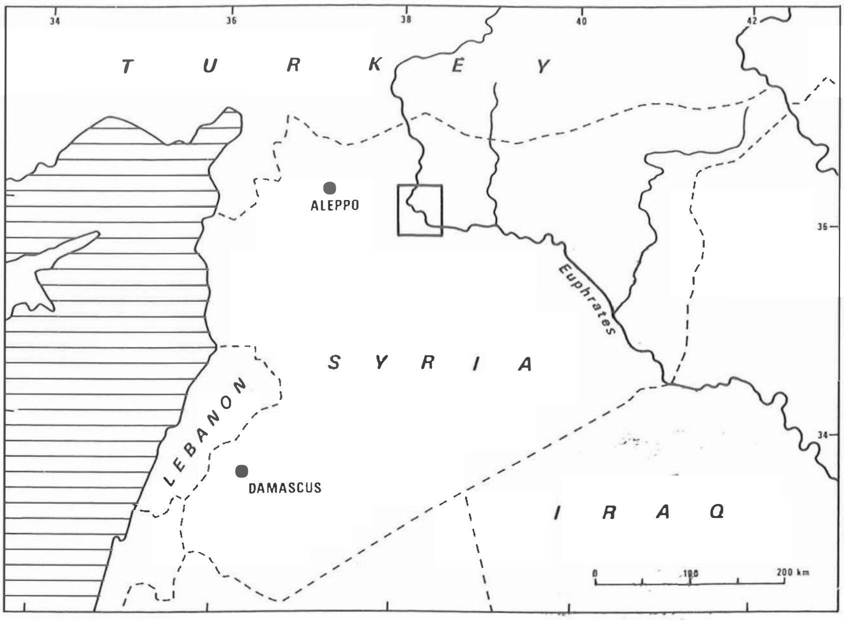

Fig. 1. Map of Syria. The framed area is shown in fig. 2.

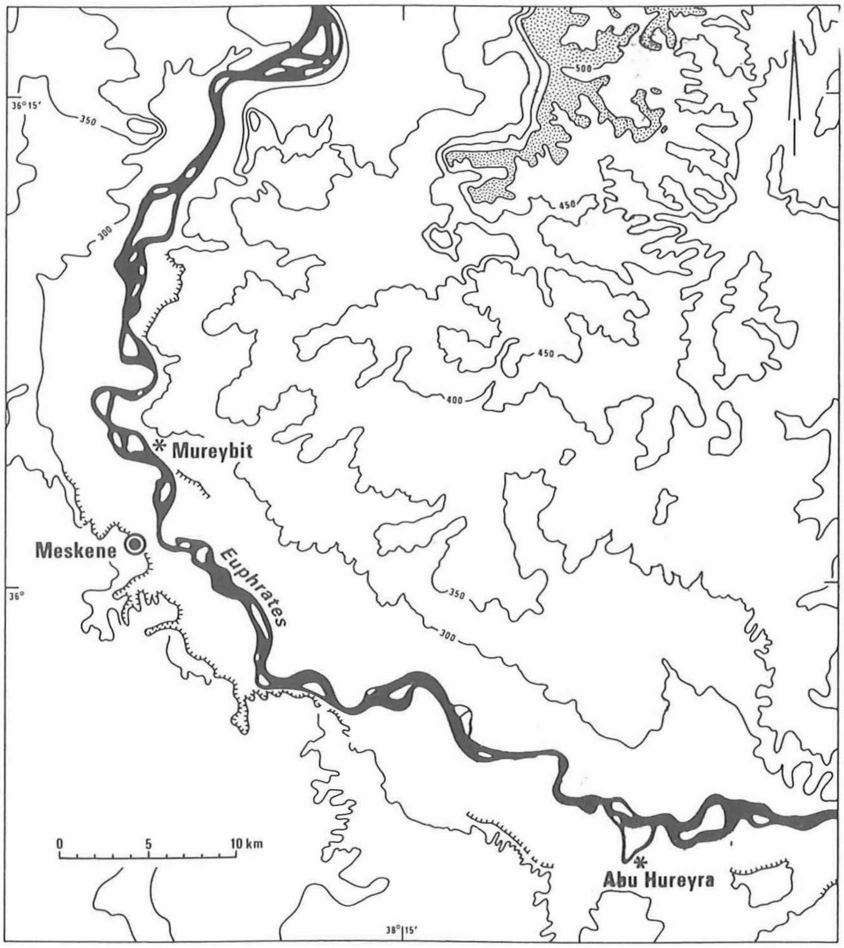

Fig. 2. Map of the Mureybit region. Areas above 500 metres are stippled.

The natural vegetation of the uplands is *Artemisia* steppe (*cf.* M. Zohary, 1973: pp. 473-480). In addition to *Artemisia herba-alba*, a great variety of plant taxa occur in steppe vegetations, of which are mentioned here: Chenopodiaceae (*Noaea*, *Salsola*, *Anabasis*), Cruciferae (*Alyssum*, *Matthiola*, *Malcolmia*), Gramineae (*Stipa*), Leguminosae (*Astragalus*), Compositae (*Centaurea*), *Plantago*, *Helianthemum* and Caryophyllaceae (*Silene*). Due to the heavy exploitation of the steppe (grazing, fuel collecting) usually impoverished remnants of the original vegetation are left. Overgrazing can lead to a predominance of *Poa sinaica* and *Carex stenophylla*. No records of the North Syrian steppe have been published.

The part of the river valley that is annually flooded was naturally covered by poplar forest. Arboreal species other than *Populus euphratica* include *Fraxinus syriaca*, *Tamarix* spp., *Vitex agnus-castus*, and *Lycium europaeum*. Moreover, *Phragmites australis*, *Scirpus maritimus* and other herbaceous marsh plants must have formed part of the natural vegetation of the flood plain. The Euphrates valley has long since been intensively cultivated. Until the sixties a few islands in the river were still covered by poplar forest.

1.2. Van Loon's excavations

The site of Mureybit was discovered during an archaeological survey undertaken by Professor M.N. van Loon (at the time Oriental Institute, University of Chicago) in 1964. Tell Mureybit is a truncated conical mound, 6 m high and 75 m in diameter, situated on a 4-m-high platform, 125 m wide and 250 m long (van Loon, 1968).

During the 1964 survey, a sounding in the form of a 2-m-wide stepped trench was undertaken on the west slope of the mound. In 1965, excavations were carried out along the slope adjoining the stepped trench (5×5 m squares P29, P30, Q29, Q30, R27, R29, R30) and on two outlying parts of the mound (squares W15, X40, X41). Besides, the stepped trench was extended up to the mound (in squares Q28 and R28). The location of the stepped trench and the squares excavated by van Loon is indicated in fig. 3 which shows also the elevation contour lines. Only in squares P29 and P30 and in stepped trench sections M28 and N28 virgin soil, consisting of a consolidated mixture of river gravel and yellow clay, was reached.

Seventeen levels (I-XVII) of prehistoric habitation have been distinguished by van Loon. In levels I-VIII, remains of oval to circular houses, 2.70 to 3.50 m in diameter, were uncovered. These remains included parts of wall foundations of limestone pieces, and floors paved with limestone slabs or consisting of hard red soil.

In levels VII to XIII sixteen round fire pits, c. 80 cm in diameter and c. 70 cm deep, were uncovered. These pits were lined with red clay which had turned black. They had been relined up to three times and were filled with ash, charcoal and river pebbles. Van Loon (1968) suggests that the fire pits had served for the parching of grain (see 3.12.).

As opposed to levels I to VIII, in levels X to XVII, rectilinear structures occurred. The walls consisted of limestone fashioned into loaf-shaped pieces and disused querns. The floors were of hard red soil or paved with limestone flags. Inside the houses there were small square or rectilinear rooms. The buildings in levels XVI and XVII had been destroyed by fire, suggesting enemy action (van Loon, 1968).

By far the majority of the artifacts consist of chipped stone implements of either chert or flint. In the upper layers (from level IX upwards), flint implements were dominant. The chipped stone industry includes scrapers, burins, perforators and projectile points (Skinner, 1968). In addition, great numbers of querns and mortars of limestone were found. Bone artifacts were recovered as well.

1.3. Cauvin's excavations

In 1971-1974, excavations at Mureybit were continued by J. Cauvin (Centre de Recherche d'Ecologie Humaine et de Préhistoire, Saint-André-de-Cruzières, France). Cauvin (1977) dug nine 4×4 m squares on the western part of the tell (fig. 3), in four of which virgin soil was reached. In addition, two squares were excavated by Cauvin on the eastern slope of the mound (AD28 and AD34).

Cauvin (1977) distinguishes four major habitation phases at Mureybit. In subphase IA levels no architecture was found but only hearths of different types. The majority of the stone tools are microlithic and of Natufian tradition. Subphase IB embraces only 10 to 20 cm in the areas excavated. One round house could be established for this subphase, indicated by Cauvin as Epinatufian on the basis of the chipped stone industry.

In phase II levels remains of seven round houses, with a diameter of at most 4 m, were found. Wall foundations were made of clay without stones, of clay reinforced with stones and of limestone slabs. The floors consisted of a limestone pavement or of hard red clay. Microlithic artifacts are dominant, but larger chipped stone tools, limestone querns and mortars, and bone implements occurred as well.

The architecture of phase III consisted also of round houses. The houses of this phase were divided into small compartments by low walls. The roof was supported by wooden poles. Floors and walls were always of clay. The chipped stone indus-

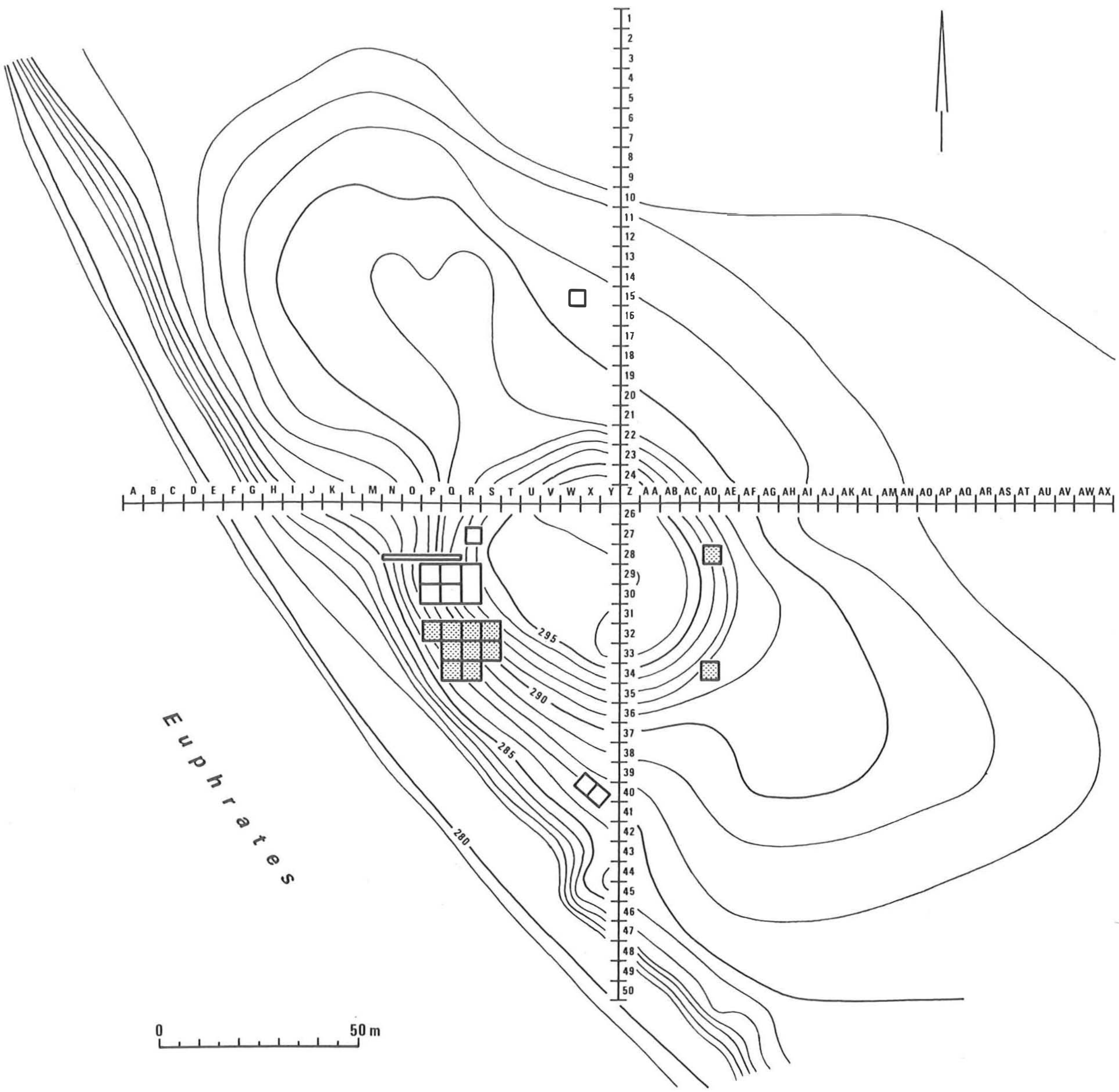

Fig. 3. Plan of Tell Mureybit with elevation contour lines and location of the squares excavated (after van Loon, 1968: fig. 1 and Cauvin, 1977: fig. 2). Shaded squares have been excavated by J. Cauvin.

try differs in various respects from that of the preceding phase (Cauvin, 1977: pp. 34-35).

Phase IV is represented only in squares AD28 and AD34. No remains of architecture were found in subphase IVA levels. The lithic industry is characterized by so-called Byblos points, by a high proportion of denticulate tools and by the presence of polished stone axes. In subphase IVB levels three parallel walls of clay were uncovered, two of which were connected at one end by a cross-wall. Chipped stone tools were made on long blades.

1.4. Dating and correlation

Twenty-eight radiocarbon dates were obtained for charcoal samples from both van Loon's and Cauvin's excavations (Cauvin, 1977: p. 47). On the basis of these dates Cauvin proposes the following chronology of his phases in conventional radiocarbon years (half-life value of 5568 years):

subphase IVB:	7300-6900 B.C.
subphase IVA:	7600-7300 B.C.
phase III:	8000-7600 B.C.

phase II: 8200-8000 B.C.
subphase IB: 8300-8200 B.C.
subphase IA: 8500-8300 B.C.

An approximate correlation between van Loon's levels and Cauvin's phases has been made on the basis of the stone industry. Van Loon's levels I-VIII should correspond to phase II and levels IX-XVII to phase III. Phase I levels had not been reached by van Loon. It is curious that in phase III levels excavated by van Loon remains of rectilinear houses were uncovered, whereas Cauvin found only round houses. Must one assume that within a short distance marked differences in architecture existed, or have different phase III levels been excavated by van Loon and Cauvin?

According to the excavator, Mesolithic (late-Palaeolithic) habitation at Abu Hureyra, some 30 km southeast of Mureybit, on the right bank of the Euphrates (fig. 2), began c. 9500 B.C. and the Mesolithic villagers abandoned the site c. 8500 B.C. (Moore, 1979). M.-C. Cauvin (1983: fig. 1) assumes a much shorter Mesolithic habitation of Abu Hureyra, *viz.* c. 8800-8500 B.C. However this may be, it seems that habitation at Mureybit started at the time Abu Hureyra was given up by its inhabitants.

The re-occupation of Abu Hureyra by 'archaic' Neolithic man is dated to about 7500 B.C. (Moore, 1979). The earliest Neolithic occupation of Abu Hureyra would coincide with that of phase IV at Mureybit. The phase IV habitation of Mureybit may likewise have been of (early) Neolithic tradition. Mureybit was abandoned around 6900 B.C., but Neolithic Abu Hureyra developed into a large settlement which was inhabited until the middle of the sixth millennium B.C.

1.5. Animal remains

Animal remains include shell-fish (*Unedo tigridis, Melanopsis, Theodoxus*), fishes (particularly *Barbus* and *Silurus*) and birds (Cauvin, 1977). The mammalian bones have been studied by Ducos (1975, 1978). Most frequent are *Equus asinus* (wild ass) and *Gazella* spec. *Bos taurus* (wild cattle) shows the highest frequencies in phase IV, but is represented in all levels. Other species hunted include: *Ovis orientalis* (wild sheep), *Dama mesopotamica* (Persian fallow deer) and *Sus scrofa* (wild boar). No remains of domestic animals have been recovered from the prehistoric levels. The animal bones indicate that from van Loon's level I on, the site was inhabited throughout the year (Ducos, 1978: pp. 89-91).

2. THE SAMPLES

During various field-work seasons samples were taken for botanical examination. The first series of samples was secured in 1965 (1.2.). Carbonized plant remains were recovered by means of manual water flotation of samples from the cultural fill. The sampling and the flotation were carried out under the direction of the excavator (M.N. van Loon). Some samples of the 1965 campaign (nos. 3, 16-20, see table 3) consist of seeds which had been

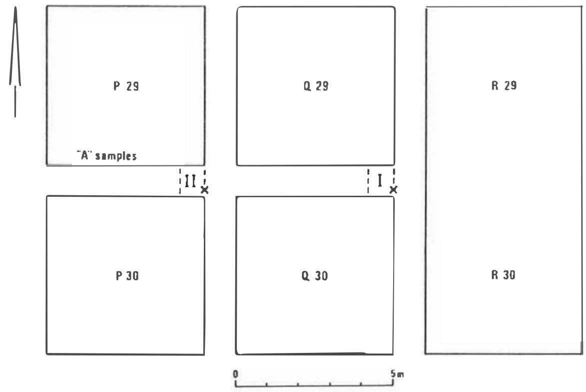

Fig. 4. Location of sample series I and II.

Table 1. Botanical samples from Cauvin's excavations.

Year of sampling	No.	Square	Locus	Layer	Description	Phase
1972	G3	Q33	W1	B4		IA
1972	3	Q33	Z1-2	B3	Structure XXIII	IA
1972	4	Q33		B4	Hearth XXXII	IA
1972	5	Q33	X3	B3	Structure XXIV	IA
1972	6	Q33	X3	B4	Hearth XXV	IA
1972	7	Q33	W1	B4		IA
1973	G1	Q33	Z1-2	B4		IA
1973	G2	Q33	Z1-2	B4a		IA
1973	G3	Q33	Z1-2	B5		IA
1973	G4	Q33	Z3	E1c		IA
1973	G5	Q34	Y-Z0-1	C1d		IB
1972	1	Q33	Y-Z1-2	A1	Fire pit XIII	II
1972	2	Q33	Z1	B1	Fire pit XVII	II
1972	G1	Q33	Y-Z1-2	A1	Fire pit XIII	II
1972	G2	Q33	Z1	B1	Fire pit XVII	II
1973	G6	Q34	Y-Z1-2	C1c		II
1973	G7	Q34	Y-Z1-2	C1b		II
1973	G8	Q34	Y-Z1-2	C1		II
1973	G9	Q34	X2	B2c	Ashy layer	II
1974	G1	AD34	3.75-3.90 m			IVA
1974	G2	AD34	3.90-3.95 m			IVA
1974	G3	AD34	4.00-4.15 m			IVA
1974	G4	AD34	4.17 m			IVA

Table 2. Numbers of seeds and fruits from phase I and II levels.

Phase	IA										IB	II													
Year of sampling	1972						1973				1973	1965	1967												
Square, level, etc.	G3	3	4	5	6	7	G1	G2	G3	G4	G5	1	Series II												
	Q33/B4	Q33/B3	Q33/B4	Q33/B3	Q33/B4	Q33/B4	Q33/B4	Q33/B4a	Q33/B5	Q32/E1c	Q34/C1d	P29/II-V	60 cm	95 cm	115 cm	135 cm	170 cm	185 cm	205 cm	220 cm	235 cm	255 cm	200 cm A	225 cm A	260 cm A
Adonis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alyssum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Androsace maxima	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Arnebia decumbens	-	1	2	13	24	-	40	31	3	9	2	-	2	1	-	-	1	-	-	-	3	-	4	4	-
Arnebia linearifolia	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Asparagus	-	1	-	-	-	43	85	23	1	11	2	-	-	-	-	-	-	-	-	-	-	-	-	½	5
Astragalus	1	3	-	3	-	1	8	9	1	14	24	3	1	-	14	1	5	-	4	2	-	2	3	2	-
Atriplex-type	-	1	-	1	-	-	2	2	-	-	-	-	-	-	1	-	-	-	-	1	1	22	10	5	-
Bellevalia	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Bromus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	½
Capparis	-	-	-	1	1	2	4	-	-	2	5	-	-	2	4½	½	3	-	-	1	1	-	-	4	1
Centaurea (large)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Centaurea (medium-sized)	-	-	-	-	-	½	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Centaurea (small)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Chenopodium album-type	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	2	-	11	9	1	1
Convolvulus-type	-	-	-	-	-	1	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified Cruciferae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-
Echinochloa (crus-galli)	-	-	-	-	-	-	-	1	-	-	22	-	-	-	-	-	-	-	-	-	-	2	-	-	3
Eremopyrum	-	-	-	-	-	-	-	2	-	3	1	-	-	-	1	-	1	1	1	-	2	-	1	-	-
Fumaria	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Galium	-	-	-	-	-	-	-	-	-	-	1	-	1	1	2	1	-	1	3	1	-	-	-	2	1
Unidentified Gramineae	-	-	1	1	-	-	1	1	-	1	-	2	-	-	-	-	-	1	-	-	-	-	1	-	-
Gypsophila	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	2	-	-	-	-	-	3	-	-	-
Heliotropium	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Hordeum (spontaneum)	-	-	-	1½	-	-	1	-	-	-	1	½	-	-	1	-	-	-	-	-	-	-	-	-	-
Hordeum spec.	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Lathyrus (cicera)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified Leguminosae	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Lens	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-
Lepidium-type	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linum	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Lithospermum arvense	1	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithospermum tenuiflorum	-	2	-	4	-	-	10	13	4	11	25	-	17	37	9	-	4	17	8	6	24	1	31	16	11
Malva	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Medicago	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Pistacia	-	+	-	-	+	?	½	+	?	?	+	-	+	?	+	?	½	?	½	?	1	4	-	-	?
(cf.) Pisum	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-
Polygonum	13	4	1	9	-	22	143	25	-	81	14	19	5	2	56	14	1	3	19	34	59	563	88	94	75
Potamogeton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Scirpus maritimus	1	-	-	2	-	-	14	9	3	12	10	-	-	1	-	1	-	-	-	-	1	36	-	4	-
Setaria-type	-	-	-	1	-	-	1	-	-	-	10	-	1	-	7	-	-	1	-	-	-	16	-	-	-
Silene	-	-	-	-	-	-	1	-	-	-	-	4	1	-	5	2	-	-	2	-	3	7	-	-	-
Solanum-type	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suaeda	1	-	-	1	-	-	3	1	-	1	-	-	-	-	-	-	-	-	-	-	1	4	2	5	-
Trigonella-type	-	-	-	1	-	-	1	2	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-
Trigonella astroites-type	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Triticum boeoticum thaoudar	-	-	-	-	-	1	4	3	-	4	-	1	2½	-	-	-	-	-	-	-	-	-	-	-	-
Triticum (domestic type)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	1	-	-
Ziziphora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-
Unidentified	-	-	-	2	1	3	10	3	-	5	-	2	3	-	12	-	-	-	1	6	2	6	2	1	1

recognized by the naked eye in a section or on a surface. Altogether 22 samples had been collected in 1965, two of which did not yield seeds.

The results of the examination of the 1965 samples have already been published (van Zeist, 1970). A re-examination of these samples showed that some of the identifications were incorrect. For that reason the full results of the analysis of these samples are presented again. Most of the 1965 samples must be attributed to Cauvin's phase III (levels IX-XVII, see 1.4.) and are shown in table 3. One phase II sample (no. 1, P29/II-V) is shown in table 2. Two samples (nos. 14 and 15, see van Zeist, 1970: table 1) could not be attributed to anyone of

								Phase
1972				1973				Year of sampling
1	2	G1	G2	G6	G7	G8	G9	Square, level, etc.
Q33/A1	Q33/B1	Q33/A1	Q33/B1	Q34/C1c	Q34/C1b	Q34/C1	Q34/B2c	
-	-	-	-	-	3	-	-	Adonis
-	-	-	-	-	-	1	-	Alyssum
-	-	-	1	1	-	-	-	Androsace maxima
-	3	-	3	65	23	76	-	Arnebia decumbens
-	-	-	-	-	2	-	-	Arnebia linearifolia
-	-	-	-	-	-	-	-	Asparagus
-	20	1	8	37	33	38	5	Astragalus
-	-	-	-	1	-	2	-	Atriplex-type
-	-	-	-	3	2	-	-	Bellevalia
-	-	-	-	-	-	-	-	Bromus
-	5	1	2	4	32	38	2	Capparis
-	-	-	-	-	1	-	-	Centaurea (large)
-	1	-	-	-	-	-	-	Centaurea (medium-sized)
-	-	-	-	-	-	-	-	Centaurea (small)
-	-	-	-	-	-	1	-	Chenopodium album-type
-	1	-	-	-	1	1	-	Convolvulus-type
-	-	-	-	-	-	-	-	Unidentified Cruciferae
-	-	-	-	3	-	1	-	Echinochloa (crus-galli)
-	1	-	-	1	1	2	1	Eremopyrum
1	-	-	-	-	-	-	-	Fumaria
-	1	-	-	1	3	1	1	Galium
-	7	-	1	2	1	-	-	Unidentified Gramineae
-	-	-	-	-	-	-	-	Gypsophila
-	-	-	-	-	1	1	-	Heliotropium
-	-	-	-	1	-	-	-	Hordeum (spontaneum)
-	-	-	1	-	-	-	-	Hordeum spec.
-	-	-	-	-	-	-	-	Lathyrus (cicera)
-	-	-	-	-	-	-	-	Unidentified Leguminosae
-	-	-	-	-	2	1	-	Lens
-	-	-	-	-	-	-	-	Lepidium-type
-	1	-	-	-	-	-	-	Linum
-	-	-	-	1	-	-	-	Lithospermum arvense
-	-	-	2	52	26	29	8	Lithospermum tenuiflorum
-	-	-	-	-	-	-	-	Malva
-	-	-	1	-	-	-	-	Medicago
?	?	-	-	?	-	+	?	Pistacia
-	1	-	-	-	-	1	1	(cf.) Pisum
1	4	1	-	7	12	12	2	Polygonum
-	-	-	-	-	-	-	-	Potamogeton
-	1	-	-	4	4	6	-	Scirpus maritimus
-	-	-	-	-	-	1	-	Setaria-type
-	-	-	-	1	1	4	-	Silene
-	-	-	-	-	-	-	-	Solanum-type
-	-	-	-	-	-	-	-	Suaeda
-	1	-	-	1	-	-	-	Trigonella-type
-	-	-	-	-	-	2	-	Trigonella astroites-type
-	-	-	-	-	2½	1	1	Triticum boeoticum thaoudar
-	-	-	-	-	-	-	-	Triticum (domestic type)
-	-	-	-	-	-	-	-	Ziziphora
-	-	-	1	7	2	6	2	Unidentified

Cauvin's phases and have therefore been left out here.

In the spring of 1967, two series of samples from exposed sections of van Loon's excavations were collected and floated by S. Bottema and W. van Zeist. This sampling was carried out from Selenkahiye, on the opposite bank of the Euphrates, where at the time the first excavation campaign was directed by M.N. van Loon. Sample series I was taken from the east end of the balk between squares Q29 and Q30 (fig. 4). In these squares the virgin soil had not been reached. In the section along the north balk of Q29 levels IX to XV were exposed (van Loon, 1968: fig. 10), suggesting that the series I samples have to be attributed to phase III. The results of the examination of these samples are presented in table 3. The depths are those below the surface of the tell at the sampling locality (east end of balk between Q29 and Q30). It should be mentioned that from the sample at 40-50 cm below the surface a pottery sherd was recovered pointing at possible contamination with younger material.

Another series of samples (series II) was secured from the east end of the balk between squares P29 and P30 (fig. 4). At this locality, the culture deposit between 260 cm and the virgin soil yielded almost no charred vegetable remains. For that reason, five additional samples marked with A were secured at a greater distance from the east face of the squares:

200 cm A, c. 3.00 m
225 cm A, c. 1.75 m
260 cm A, c. 3.50 m } from the east fase
300 cm A, c. 1.50 m
320 cm A, c. 1.00 m

The depths of these samples are taken with respect to the surface at the east end of the balk. The drawings of the north faces of P29 and P30 (van Loon, 1968: fig. 10) show levels I to VIII, implying that the series II samples belong to Cauvin's phase II (table 2). For both series, per sample about one bucket of soil was processed.

In 1972-1974, soil samples for botanical examination were collected and floated by members of Cauvin's excavation team. These samples are listed in table 1. One might wonder why no phase III samples were taken, although these levels have been extensively excavated by Cauvin (1977: p. 28). This is due to the instructions of the first author who at the time was of the opinion that from levels already examined by van Loon no more samples were needed. On second thoughts phase III samples from squares excavated by Cauvin should have been included in the botanical examination because of the differences in architecture (rectilinear houses versus round houses; see 1.2. and 1.3.). A few more phase II samples from Cauvin's squares would have been useful as well. The data obtained for the phase I and II samples are presented in table 2 and those for the phase VIA samples in table 3.

3. THE PLANT REMAINS

Seed and fruit types not described in previous contributions to this series (nos. 1 and 2) will be treated here at some length. As for the other plant taxa,

Table 3. Numbers of seeds and fruits from phase III and IV levels.

Phase	III																	III							
Year of sampling	1965																	1967							
Square, level, etc.	2	3	16	18	19	17	20	4	5	6	7	8	9	10	11	12	13	Series I							
	Q29/VIII-X	Q29/VIII-X	Q29/VIII-XII	Q30/VIII-XII	Q30/X	Q30/XI-XII	Q30/XI-XII	Q29/XI	Q29/XIII-XIV	Q30/XIII-XIV	Q29/XIV	Q28/XV	R27/XV	R27/XV	R29/XVI	R28/XVI-XVII	R29/XVII-XVIII	40-50 cm	60-70 cm	90-100 cm	130 cm	150 cm	180 cm	195 cm	215 cm
Adonis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amaranthus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Androsace maxima	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arnebia decumbens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	1	-	2	-	-	-	5
Arnebia linearifolia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	1	-
Astragalus	-	-	-	-	-	-	-	-	1	1	3	1	2½	4	2	-	-	-	1	1	1	-	-	2	2
Atriplex-type	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Bellevalia	-	-	-	-	-	-	-	½	-	-	1	-	2	-	-	-	-	-	-	1	-	1	-	-	-
Bromus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capparis	-	-	-	-	-	-	-	-	1	2	3	-	-	-	-	1	-	-	-	-	-	-	-	9	1
Centaurea (large)	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	½	3	1	2
Chenopodium album-type	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Unident. Cruciferae	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Cuscuta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unident. Cyperaceae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Eremopyrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Ficus	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	+	-	-	-	-
Galium	1	-	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	3	88	2	-	-	10
Unident. Gramineae	1	-	-	-	-	-	-	-	-	-	1	-	1	3	-	-	-	-	-	-	1	-	-	-	1
Gypsophila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1
Heliotropium	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Hordeum (spontaneum)	9	-	5	2	2	2½	1	6	2	2½	2½	1	½	1½	2½	-	1	-	-	1	9½	3½	41	15	54
Hordeum spontaneum internodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Hordeum vulgare	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Hordeum spec.	1	-	-	1	-	-	-	-	-	1½	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1
Juncus	+++	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unident. Leguminosae	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Lens	-	-	-	-	-	-	-	2	6	1	½	-	3	7	2	-	-	-	-	-	5	1	-	-	1
Lithospermum arvense	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithospermum tenuiflorum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	2	7	49	17	5	14	9
Malva	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Medicago	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micromeria	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	-
Pistacia	-	-	-	-	-	-	-	-	+	-	+	-	+	+	-	-	-	?	+	3	10	½	?	3½	+
(cf.) Pisum	-	-	-	-	-	-	-	5	2	-	2	-	-	1	-	-	1	-	-	1	1	-	-	-	-
Polygonum	5	-	-	-	-	-	-	3	6	2	18	3	65	40	4	-	8	2	2	7	26	17	50	81	19
Portulaca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1
Scirpus maritimus	-	-	-	-	-	-	-	-	-	-	1	-	6	3	-	-	-	-	-	2	2	6	-	1	1
Setaria-type	1	-	-	-	-	-	-	1	-	2	-	-	1	-	-	-	-	-	-	-	1	2	4	-	12
Silene	-	-	-	-	-	-	-	1	-	-	-	-	19	8	2	-	1	-	-	-	3	-	1	2	3
Solanum-type	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Suaeda	1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	1	-	1	-	2	1
Thymelaea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trifolium-type	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Trigonella-type	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Trigonella astroites-type	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum boeoticum aegilopoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triticum boeoticum thaoudar	1250	450	50	-	4	12	3	3	3	75	-	½	1	1	1	1	½	-	1	3	63	17	203	276	73
Triticum (domestic type)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Vicia ervilia	-	-	-	-	-	-	-	1	2½	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Vicia spec.	-	-	-	-	-	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Unidentified	3	-	-	-	-	-	-	5	3	1	4	-	10	7	2	-	4	-	3	2	5	-	2	2	2

			IV				Phase
			1974				Year of sampling
			G1	G2	G3	G4	Square, level, etc.
285 cm	305 cm	320 cm	AD 34	AD 34	AD 34	AD 34	
-	-	-	1	1	1	-	Adonis
-	-	-	-	-	-	-	Amaranthus
-	-	-	1	1	1	-	Androsace maxima
1	1	-	8	14	15	4	Arnebia decumbens
1	-	-	-	1	-	-	Arnebia linearifolia
1	1	-	17	5	1	1	Astragalus
-	-	-	-	-	-	-	Atriplex-type
-	1	-	-	-	-	-	Bellevalia
-	-	-	-	-	-	-	Bromus
1	1	1	-	-	-	1	Capparis
2	-	-	-	-	-	1	Centaurea (large)
-	-	-	-	-	-	-	Chenopodium album-type
-	-	-	-	-	-	-	Unident. Cruciferae
-	-	-	-	2	-	-	Cruscuta
-	-	-	-	-	-	-	Unident. Cyperaceae
-	-	-	-	-	-	-	Eremopyrum
-	-	-	-	-	-	-	Ficus
-	2	3½	2	-	1	-	Galium
-	-	1	-	3	-	1	Unident. Gramineae
5	5	-	-	-	-	-	Gypsophila
-	-	1	-	-	-	-	Heliotropium
6	1	1½	-	1	-	2	Hordeum (spontaneum)
-	-	-	-	-	-	-	Hordeum spontaneum internodes
-	-	-	-	-	-	-	Hordeum vulgare
-	-	-	-	-	-	-	Hordeum spec.
-	-	-	-	-	-	-	Juncus
-	-	1	1	-	-	-	Unident. Leguminosae
-	1	-	2	1	2	3	Lens
2	-	-	-	-	-	-	Lithospermum arvense
2	3	3	15	4	6	1	Lithospermum tenuiflorum
-	-	-	-	-	-	-	Malva
-	-	-	2	-	1	-	Medicago
-	-	-	-	-	-	-	Micromeria
+	½	1	+	+	+	-	Pistacia
-	-	-	-	1	1	-	(cf.) Pisum
19	2	5	1	-	-	-	Polygonum
-	-	-	-	-	-	-	Portulaca
-	1	1	1	2	1	-	Scirpus maritimus
2	2	-	-	-	-	-	Setaria-type
-	2	-	-	-	-	-	Silene
-	-	-	-	-	-	-	Solanum-type
3	-	-	-	-	-	-	Suaeda
-	-	1	-	-	-	-	Thymelaea
-	-	-	-	-	-	-	Trifolium-type
-	-	-	-	-	-	-	Trigonella-type
-	-	-	-	-	-	-	Trigonella astroites-type
-	-	-	-	-	-	-	Triticum boeoticum aegilopoides
170	14	15	4	3	-	-	Triticum boeoticum thaoudar
-	-	-	-	-	-	-	Triticum (domestic type)
-	-	-	-	-	-	-	Vicia ervilia
-	-	-	1	-	-	-	Vicia spec.
3	1	3	5	1	-	-	Unidentified

only some additional information relevant to the Mureybit material will be presented. All measurements (tables 4-12) are in mm.

The numbers of unidentified seeds and fruits are quite considerable. Sometimes poor preservation prevented the identification, but various types could not be determined because no matching reference material was available. The unknown types do not occur frequently, usually in one or two samples only.

3.1. Amaranthaceae

Amaranthus. Lenticular seed with a ridged margin, surface smooth (fig. 5: 1). Diameter 1.5 mm, thickness 0.95 mm. Only one seed of this type was found (Mb 1965, no. 11). The seed conforms to those of *Amaranthus angustifolius* Lam. (= *A. graezicans* L.) present in the B.A.I. reference collection. This species is native to the Mediterranean area.

3.2. Anacardiaceae

Pistacia. Pistachio nutshell fragments occur quite frequently, but only one intact nut was found (in Mb 1967, II 255 cm: 5.0×5.2×3.2 mm). As for the representation of *Pistacia* in the Mureybit samples, the following should be remarked. The sorting of the samples from 1967 and later yielded only a few pistachio nut remains. As this seemed rather strange, some of the residues were inspected for possible nutshell fragments. As this gave a positive result, it was decided to re-examine at least part of the residues for pistachio nutshell fragments (and possible other plant remains). A question mark in tables 2 and 3 indicates that the sample concerned has not been re-examined and that consequently it is not known whether or not it contains pistachio remains.

The pistachio fragments have, as usual, been converted to whole specimens on the basis of 0.021 gram per nutshell (van Zeist & Bakker-Heeres, 1982(1985): 5.2.). A plus-sign (+) indicates that the fragments equal less than half a nutshell. At present *Pistacia* (*atlantica*) is not found in the vicinity of Mureybit.

3.3. Boraginaceae

The particular problems concerning boraginaceous fruits in archaeological sites need not be repeated here. In some of the Mureybit boraginaceous nutlets charred remains of the inner fruit could be observed. The state of preservation does not point to modern intrusions.

No particular significance should be attached to the conspicuous absence of boraginaceous fruits in

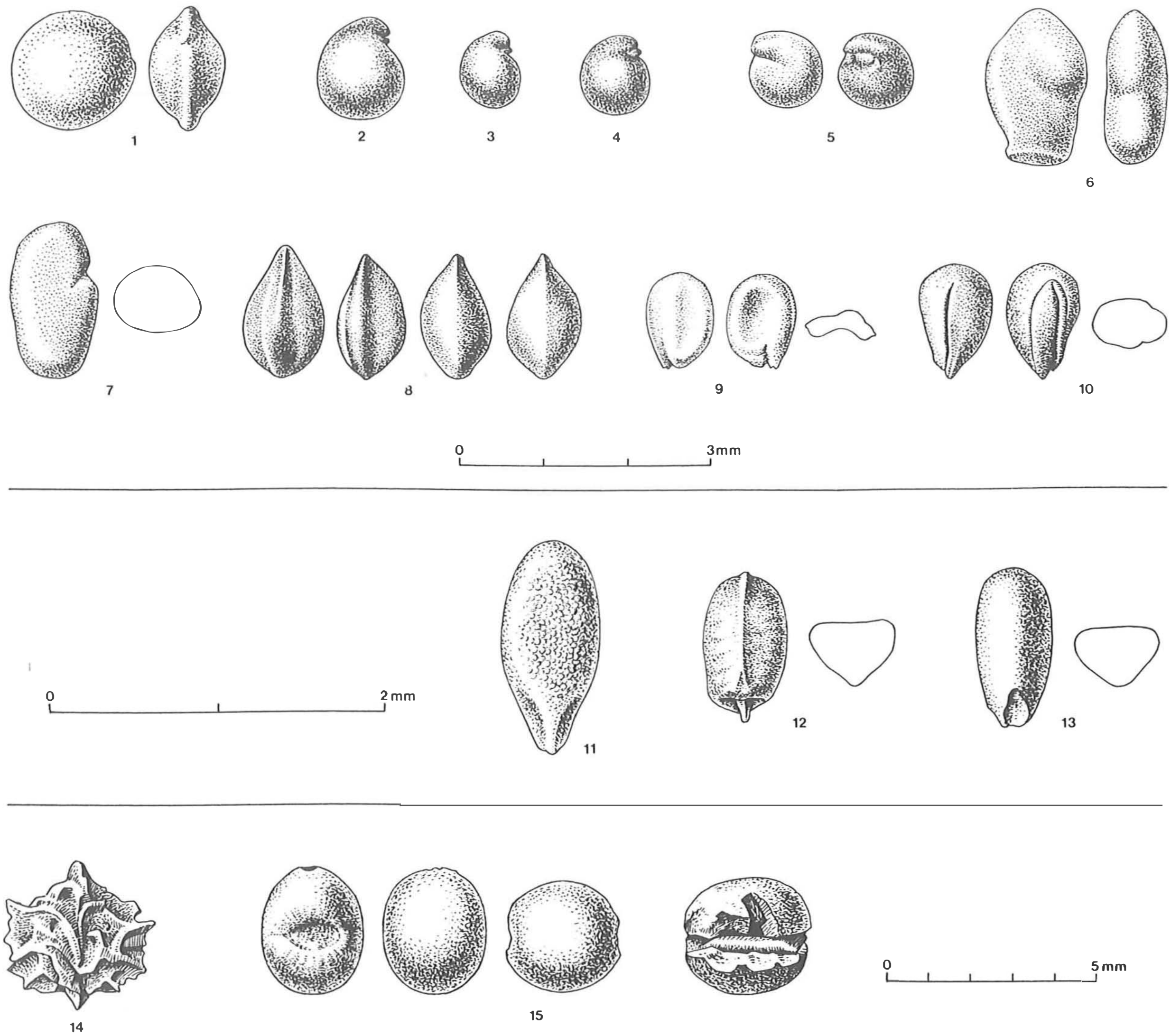

Fig. 5. 1: *Amaranthus,* Mb'65, no. 11; 2: *Suaeda,* Mb'67, I 150; 3: *Suaeda,* Mb'67, I 215; 4: *Suaeda,* Mb'67, I 265; 5: *Chenopodium album,* Mb'67, II 200A; 6: *Potamogeton,* Mb'67, II 255; 7: *Trigonella*-type, Mb'73, G6; 8: *Polygonum venantianum*-type, Mb'67, II 255; 9: *Alyssum,* Mb'67, II 115; 10: *Lepidium,* Mb'67, II 320; 11: *Ziziphora,* Mb'67, II 115; 12: *Micromeria,* Mb'65, no. 9; 13: *Micromeria,* Mb'65, no. 13; 14: Unidentified, Mb'73, G9; 15: *Asparagus,* Mb'73, G1.

the 1965 samples because this is probably due to the way the plant remains were recovered. The flotation of the soil samples, which was carried out by one of labourers, may not have yielded optimum results due to the inexperience of the excavator with this method. Other samples were obtained by searching the exposed sections for charred (black) seeds. Seeds of another colour (such as those of Boraginaceae) may not have been collected (communication by Professor M.N. van Loon).

Arnebia. Two *Arnebia* species are represented in the Mureybit seed record, viz. *A. decumbens* (Vent.)Coss. et Kral. and *A. linearifolia* DC., which are both plants from steppe and desert-steppe vegetations. The nutlets of *A. linearifolia* differ from those of *A. decumbens* in size, shape and surface structure (fig. 6: 1, 2, 3). The squat nutlets of *A. linearifolia* have a broad, triangular base and widely spaced, large verrucae. The surface of *A. decumbens* nutlets is densely covered with wart-like projections. Although characteristic fruits of both species can easily be distinguished one from the other, in some cases the species determination had to remain somewhat arbitrary.

A. decumbens is one of the most common seed

Table 4. Dimensions of boraginaceous fruits.

		L	B
Arnebia decumbens			
Mb 1973	Min.	1.7	1.2
Q34/Cl c (G6)	Aver.	1.97	1.43
N = 55	Max.	2.5	1.9
Mb 1973	Min.	1.7	1.2
Q34/Cl (G8)	Aver.	2.10	1.50
N = 64	Max.	2.6	1.8
Arnebia linearifolia			
Various samples	Min.	2.5	2.1
N = 14	Aver.	2.96	2.48
	Max.	4.3	3.8
Lithospermum tenuiflorum			
Mb 1973	Min.	2.0	1.4
Q34/Cl c (G6)	Aver.	2.25	1.56
N = 49	Max.	2.5	1.8
Mb 1967	Min.	1.8	1.3
I 130 cm	Aver.	2.19	1.59
N = 41	Max.	2.4	1.7

types at Mureybit. Of *A. linearifolia* only small numbers of fruits were recovered. For the dimensions of the nutlets of both *Arnebia* species see table 4.

Heliotropium. *Heliotropium* fruits from other Near Eastern archaeological sites are illustrated in van Zeist (1979-80: fig. 1: 3) and in van Zeist & Bakker-Heeres (1982(1985): fig. 23: 7). Only few *Heliotropium* fruits were found in Mureybit.

Lithospermum. Of the two *Lithospermum* species attested for Mureybit, *L. tenuiflorum* L.fil. (*Buglossoides tenuifolia* (L.fil.)Johnston) is most common. *L. arvense* L. (*Buglossoides arvensis* (L.)Johnston) is scarcely represented in the seed record. A characteristic feature of the *L. tenuiflorum* nutlets are the prominent humps on both sides. The triangular base is much smaller than in *L. arvense* fruits. Both *Lithospermum*-type fruits are depicted in van Zeist & Bakker-Heeres (1982 (1985): fig. 22: 5, 6). *L. tenuiflorum* occurs naturally in steppe vegetations. The dimensions of the fruits of this species are presented in table 4; they are somewhat smaller than those from Ramad.

3.4. Capparidaceae

Capparis. Slightly compressed seeds, more or less elliptic in outline, with a prominent, curved radicle (fig. 6: 10, 11). The seed wall is smooth. Dimensions of 17 reasonably well preserved specimens: 2.46 (1.9-2.8)×1.94(1.6-2.4) mm. Most of the seeds were more or less seriously damaged, resulting in the disappearance of (parts of) the outer and inner seed wall. Not seldom only the typical coiled embryo had been left (fig. 6: 11).

This seed type occurs quite frequently in Mureybit; in a few samples in an appreciable number.

3.5. Caryophyllaceae

Silene. Various samples yielded one or a few *Silene* seeds. Most of the seeds had seriously been affected by the carbonization. The majority of the seeds seem to be of the same type, 0.9-1.0 mm in diameter. A few *Silene* seeds differ from the others by the greater size (1.2-1.35 mm) and the shape.

Gypsophila seeds differ from those of *Silene* mainly by the elongated, free-standing tip of the radicle. The greatest diameter is 0.9-1.05 mm.

3.6. Chenopodiaceae

Atriplex. Flat seeds, circular to almost circular in outline, with projected tip of the radicle. The seed wall is smooth and glossy. Most of the *Atriplex* seeds had seriously been affected by the carbonization. Only 6 seeds were suitable for measuring; greatest dimension: 1.37(1.1-1.6) mm. *Atriplex* species are constituents of vegetations of saline and arid environments; some species are common in disturbed habitats.

Chenopodium album-type. Lenticular seeds. On both faces the seed wall shows a faint radial striation (fig. 5: 5). Greatest dimension of 9 seeds: 0.96(0.9-1.1) mm. In seriously damaged seeds the differentiation between *Atriplex* and *Chenopodium* was sometimes arbitrary.

Suaeda. Compressed seeds, almost circular to broadly elliptic in outline, with domed faces. In the recess between the projected tip of the radicle and the body of the seed a small protuberance is visible (fig. 5: 2, 3, 4). The seed wall is smooth. Length and breadth of 29 seeds are 1.03(0.9-1.3) and 0.87 (0.65-1.1) mm, respectively. *Suaeda* species are mainly found in more or less saline habitats (Mouterde, vol. 1: pp. 423-425).

3.7. Compositae

Centaurea-type fruits. Three types of *Centaurea* fruits are distinguished. The identification of these fruits was hampered by the fact that, with one exception, the pappus rim had not been preserved.

Of the large *Centaurea*-type fruit (fig. 6: 4, 5) the outer fruit wall had disappeared altogether. The

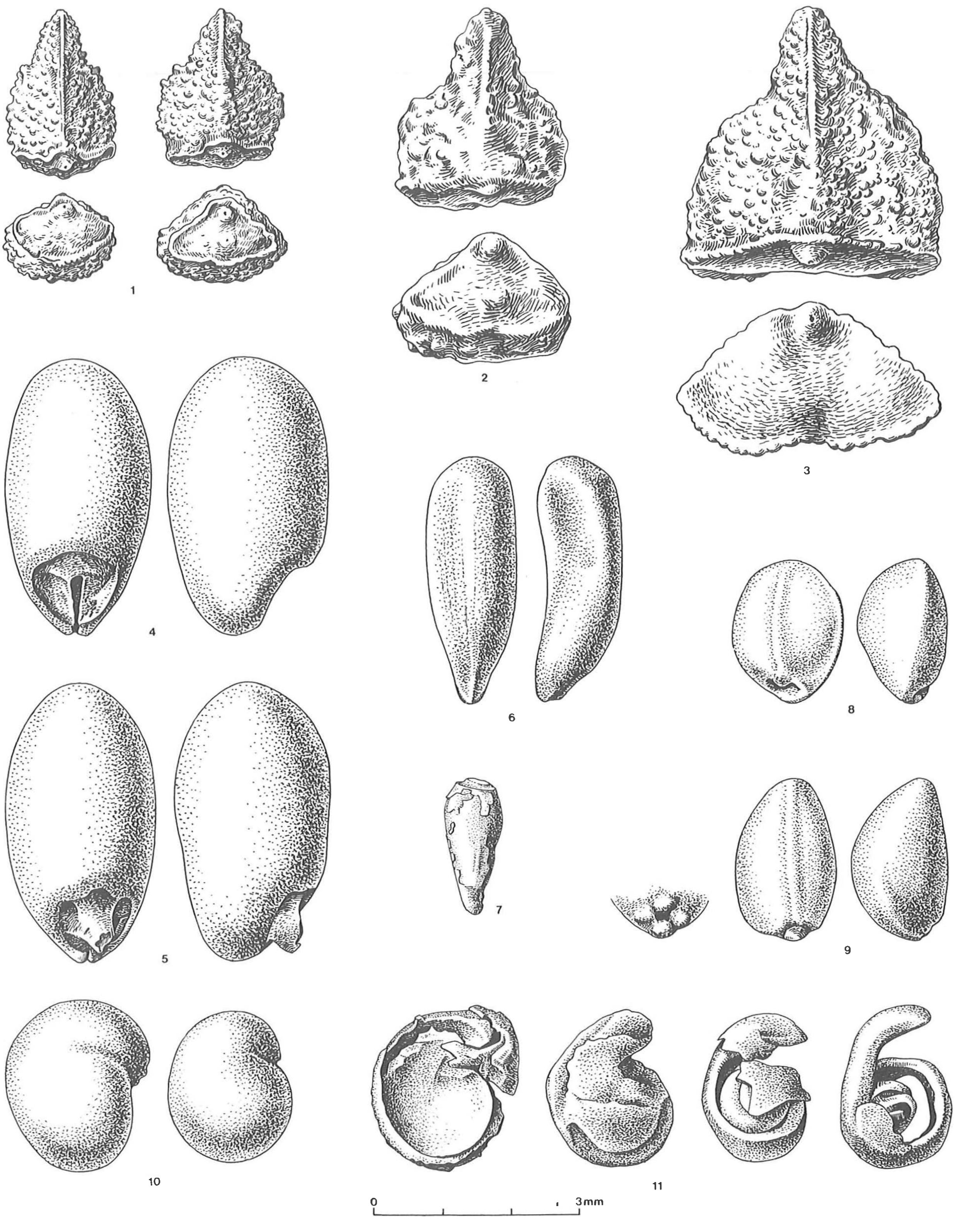

Fig. 6. 1: *Arnebia decumbens,* Mb'73, G8; 2: *Arnebia linearifolia,* Mb'67, I 130; 3: *Arnebia linearifolia,* Mb'67, I 285; 4: *Centaurea,* large, Mb'67, I 130; 5: *Centaurea,* large, Mb'67, I 215; 6: *Centaurea,* medium, Mb'73, G2; 7: *Centaurea,* small, Mb'67, II 255; 8, 9: *Convolvulus*-type, Mb'73, G1 (the irregularly thickened rim of the hilum is shown at a greater magnification); 10: *Capparis,* Mb'67, II 225; 11: *Capparis,* Mb'67, G7.

fruits are oblong in outline, more or less laterally compressed, with rounded upper and lower ends. At the base of the fruit a large indentation, crescent-shaped in lateral view, is present. The surface of the inner fruit is smooth and somewhat shiny. The large *Centaurea*-type fruit was found in a comparatively great number of samples. The dimensions of 9 fruits are 4.04(3.8-4.2)×2.09(1.8-2.3)× 2.28(2.2-2.4) mm.

The medium-sized *Centaurea*-type is rounded at the apex and pointed at the base (fig. 6: 6). A longitudinal ridge divides the depression at the base of the fruit in two halves. Fine longitudinal grooves occur on the surface. Three fruits could be measured: 3.8×1.4, 3.3×1.2 and 2.7×1.4 mm.

Only one specimen of the small *Centaurea*-type fruit was found (Mb 1967, II 255 cm). Obovate in outline (2.0×0.9 mm), truncated at the apex and pointed at the base. There is a small, but distinct indentation. This is the only *Centaurea* fruit in which remains of the pappus rim have been preserved (fig. 6: 7).

3.8. Convolvulaceae

Convolvulus-type. The identification of this seed type is unsatisfactory, which is partly due to the fact that all charred specimens are more or less seriously deformed. The seed type shows fairly much resemblance to *Convolvulus* seeds, but it is much smaller than any of the *Convolvulus* seeds in the reference collection or mentioned in the literature. The seeds are elliptic to obovate in outline. One side is distinctly domed, the other side is slightly roof-shaped to domed. At the basal end a triangular hilum with an irregularly thickened rim (fig. 6: 8, 9). The seed wall is rough. Dimensions of 7 seeds: 2.33(2.2-2.4)×1.62(1.5-1.8)×1.44(1.2-1.5) mm.

3.9. Cruciferae

Alyssum. Flat seeds, oval to obovate in outline (fig. 5: 9). The membranous wing had disappeared through carbonization which also caused puffing in some seeds. The size of the seeds in Mb 1967, II 115 cm (1.35×1.0, 1.1×0.85 mm) corresponds to that of *Alyssum desertorum* Stapf. (*A. minimum* Willd.) seeds, whereas the seed in Mb 1973, G8 (1.6×1.2 mm) compares with modern seeds of *Alyssum alyssoides* (L.)L. A rather great number of *Alyssum* species occurs in Syria (Mouterde, vol. 3: pp. 147-160).

Lepidium-type. Laterally flattened seed, obovate in outline, pointed at the base (fig. 5: 10). The surface is minutely papillose. In Mb 1967, II 320 cm. Dimensions: 1.45×0.9×0.65 mm.

Table 5. Dimensions of *Scirpus maritimus* fruits.

		L	B
Mb 1973	Min.	1.7	1.3
Q33/B4 (1)	Aver.	1.99	1.51
N = 11	Max.	2.2	1.8
Mb 1973	Min.	1.7	1.2
Q32/E1c (G4)	Aver.	1.92	1.54
N = 8	Max.	2.3	1.8
Mb 1967	Min.	1.6	1.3
II 255 cm	Aver.	1.86	1.42
N = 8	Max.	2.1	1.8

3.10. Cuscutaceae

Cuscuta. Mb 1974, G2 (phase IV) yielded two seeds attributed to *Cuscuta*. The somewhat irregularly shaped seeds are broadly elliptic to almost circular in outline. The seed wall is rough due to a pattern of low ridges. The linear hilum cannot be observed on either of the Mureybit specimens. Dimensions: 1.6×1.5×1.2 and 1.6×1.4×1.3 mm. *Cuscuta* species are parasitic on herbs and shrubs on which they twine.

3.11. Cyperaceae

Scirpus maritimus (*S. tuberosus*). The triquetrous fruits of *Scirpus maritimus* L. occur quite frequently, though only occasionally in somewhat larger numbers. For a discussion of this cyperaceous fruit type, see van Zeist & Bakker-Heeres (1982(1985): 5.11. and fig. 24: 5). The Near Eastern *Scirpus maritimus* fruits are distinctly smaller than those recovered from West-European archaeological sites. This difference in seed size could be adduced in support of the differentiation of a separate species: *Scirpus tuberosus* Desf. (Mouterde, vol. 1: pp. 167-168). It is likely that this species was a common constituent of the Euphrates valley vegetation.

The *Scirpus* fruits from three samples (table 5) show no significant differences in size. The Mureybit fruits are, on average, markedly larger than those from Aswad.

3.12. Gramineae

Triticum boeoticum (wild einkorn wheat). The wild einkorn wheat from Mureybit has already been discussed in a previous paper (van Zeist & Casparie, 1968). That discussion concerns the caryopses recovered during the first (1965) campaign, from levels subsequently attributed by Cauvin (1977) to phase III. Since then many more wild einkorn caryopses have been recovered, particularly from

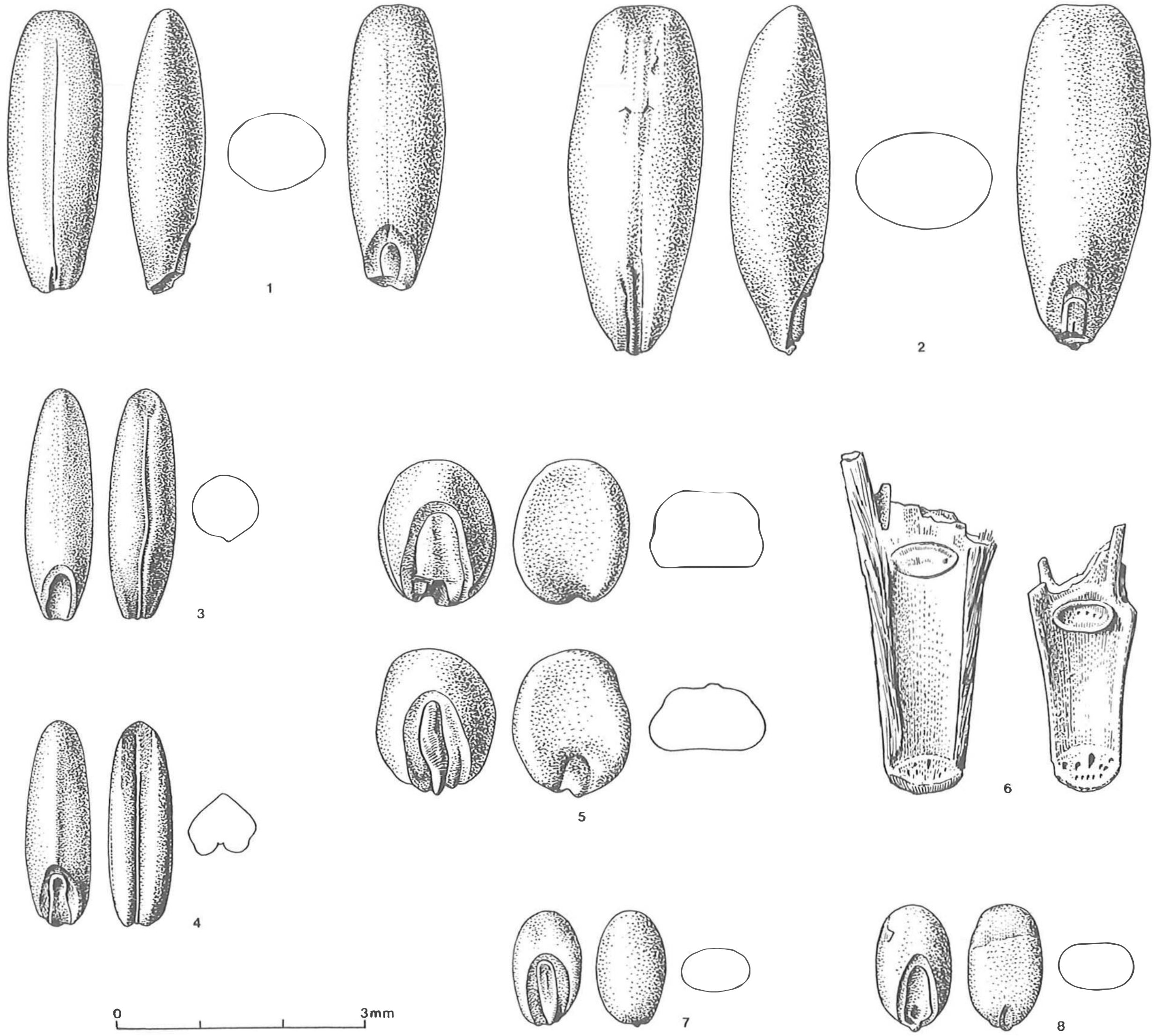

Fig. 7. 1: *Hordeum* spec., Mb'72, G2; 2: *Hordeum* spec., Mb'67, I 195; 3: *Eremopyrum*, Mb'72, no. 2; 4: *Eremopyrum*, Mb'73, G4; 5: *Echinochloa*, Mb'73, G5; 6: *Hordeum*, rachis internodes, Mb'67, I 215; 7, 8: *Setaria*-type, Mb'67, II 255.

phase III levels. The latter have not changed the picture of this grain type nor do they give occasion to reconsider the identification. The main characteristics of the Mureybit grains are repeated here.

The kernels compare to those of *Triticum boeoticum* Boiss. emend. Schiemann ssp. *thaoudar* (Reut.)Schiemann, the two-grained subspecies of wild einkorn wheat. In contrast to the one-grained ssp. *aegilopoides* (Bal.)Schiemann, in the two-grained form usually two caryopses develop in a spikelet. One-grained wild einkorn is distributed in the Balkans and western Anatolia, whereas the two-grained form is found in southeastern Turkey, northern Iraq and western Iran (Harlan & Zohary, 1966). In the contact zone between the distribution areas of both eco-geographical subspecies intermediate forms occur (Zohary, 1971).

In the Mureybit wild einkorn grains, the dorsal and the ventral sides are longitudinally almost straight or only slightly curved (fig. 8). As is evident from the index values (table 6, fig. 10), on average, the thickness is slightly greater than the breadth. The furrow on the ventral side can be narrow as well as open. In two-grained wild einkorn, the two caryopses in one spikelet are not wholly identical. As is shown in the cross-sections of modern grains, one of the grains has a protruding and the other an intruding ventral side. The same di-

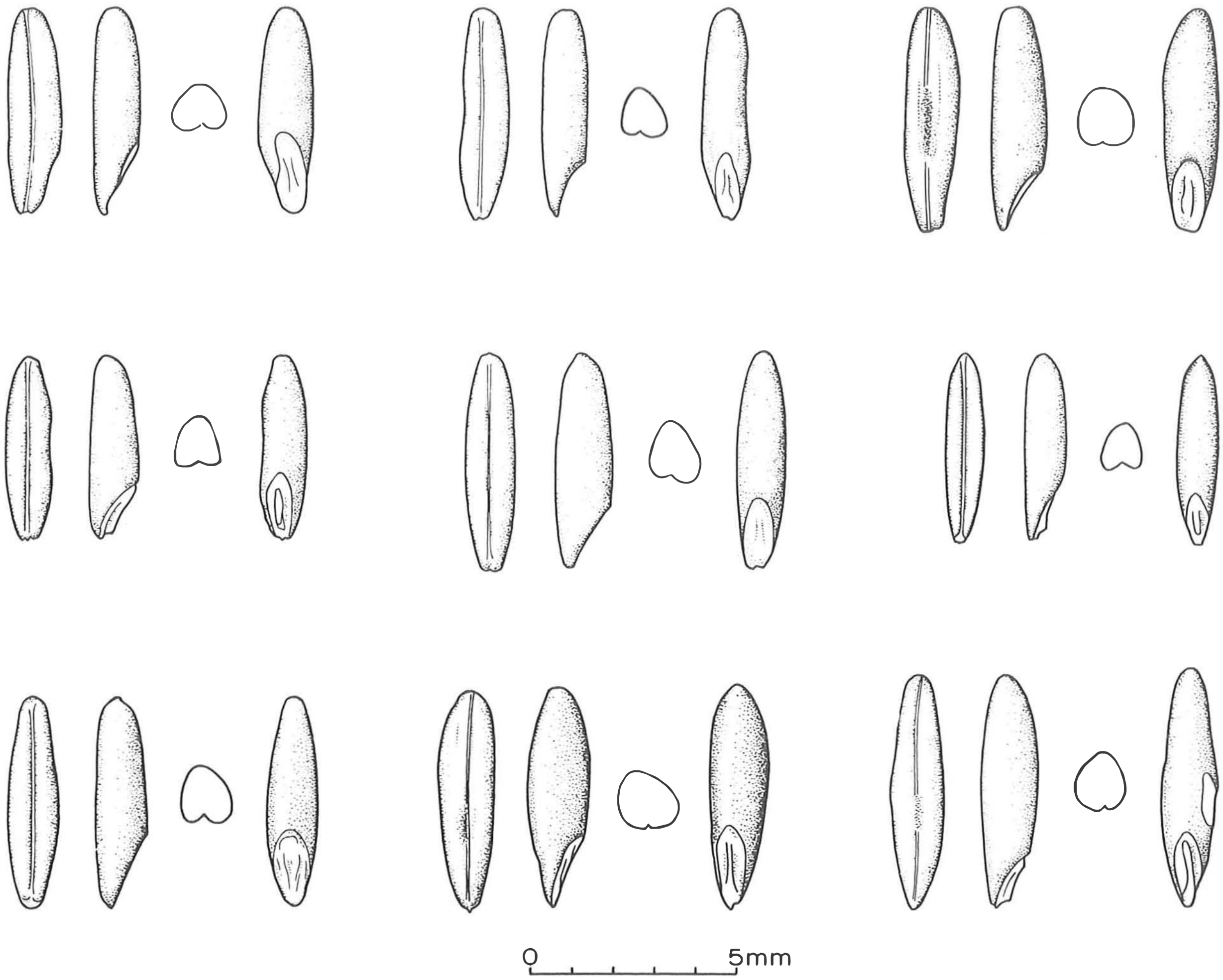

Fig. 8. *Triticum boeoticum* ssp. *thaoudar*, Mb'65, no. 2 (after van Zeist & Casparie, 1968).

Table 6. Dimensions and index values of *Triticum boeoticum* spp. *thaoudar*.

		L	B	T	L/B	T/B
Mb 1967	Min.	3.4	0.9	0.9	232	68
I 195 cm	Aver.	4.48	1.19	1.22	382	103
N = 100	Max.	5.6	1.7	1.6	542	150
Mb 1967	Min.	3.5	0.8	1.0	306	78
I 240 cm	Aver.	4.66	1.18	1.27	399	109
N = 100	Max.	6.5	1.5	1.6	570	155
Mb 1967	Min.	3.4	0.8	1.0	270	81
I 130 cm	Aver.	4.24	1.29	1.29	333	101
N = 30	Max.	5.3	1.6	1.6	510	125
Mb 1965	Min.	3.8	0.9	1.0	286	78
Q29/VIII-X (no. 2)	Aver.	4.83	1.30	1.33	376	108
N = 100	Max.	6.0	1.6	1.7	518	133

morphism can be observed in the Mureybit charred grains (fig. 9). Through carbonization the difference between the protruding and the intruding ventral side may become less pronounced or may even disappear entirely. As the status of the Mureybit einkorn wheat, *i.e.* whether it was gathered in the wild or cultivated, is questioned (see 4.3., 4.5.), it may be correct to to speak of morphologically-defined wild einkorn.

The dimensions and index values of wild einkorn grains from 4 phase III samples are shown in table 6 and fig. 10. There are slight differences in mean dimensions and index values between the samples, which could point to different strains (races) of wild einkorn, but which could also have been due to differences in the growing conditions of the (wild) crop. Curiously no other remains of this hulled wheat species, such as glume bases and spikelet forks, have been found. This suggests that the dehusking, the freeing of the grains from the spikelets, was not carried out on the site. Consequently, the fire pits uncovered by van Loon (1968: p. 268, fig. 4) very likely did not serve for the roasting of grain. Sample Mb 1965, no. 2, consisting of a group of about 1250 charred seeds, sticking to charcoal, was from the brown soil of the fire-pit area (van Loon, 1968: p. 269).

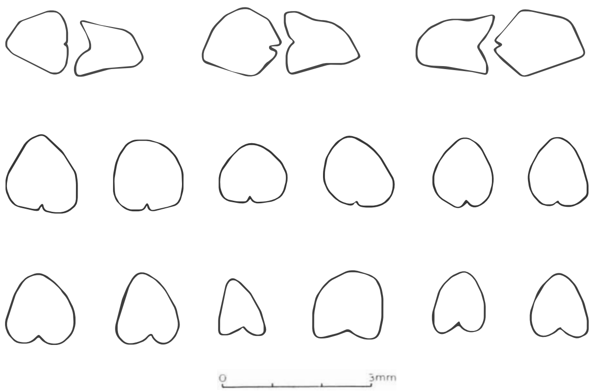

Fig. 9. Cross-sections of wild einkorn wheat grains (after van Zeist & Casparie, 1968). Upper row: 3 pairs from spikelets of modern grains; middle row: carbonized grains with protruding ventral side; lower row: carbonized grains with intruding ventral side.

Among the numerous wild einkorn caryopses, only one specimen (in Mb 1967, I 240 cm) shows the features characteristic of the one-grained ssp. *aegilopoides*: an extreme lateral compression and a distinctly curved ventral side.

Domestic-type wheat. In addition to the wild wheat-type grains, a few remains of domestic-type wheat were recovered. Mb 1967, I 40-50 cm, yielded one free-threshing wheat grain, *Triticum durum/aestivum* (4.2×2.8×2.1 mm). As from the same sample a pottery sherd was recovered, the naked wheat grain may be a contamination. One somewhat battered grain from Mb 1967, II 200 cm, is most likely of *Triticum dicoccum* and definitely a domestic wheat type (4.3×2.0×1.6 mm). A spikelet fork (Mb 1967, II 115 cm) is identical to the *Triticum dicoccum*-type spikelet forks recovered from other sites. The Mureybit spikelet fork is certainly not of a wild wheat. Both finds of hulled domestic wheat remains are somewhat puzzling.

Hordeum (*spontaneum*). In addition to wild einkorn wheat, barley is well represented at Mureybit, particularly in phase III levels. It is a two-rowed, hulled barley: the grains are all of the symmetrical type. The barley recovered during the 1965 campaign has been attributed to *Hordeum spontaneum* C.Koch, the wild progenitor of cultivated barleys (van Zeist & Casparie, 1968). *H. spontaneum* grains

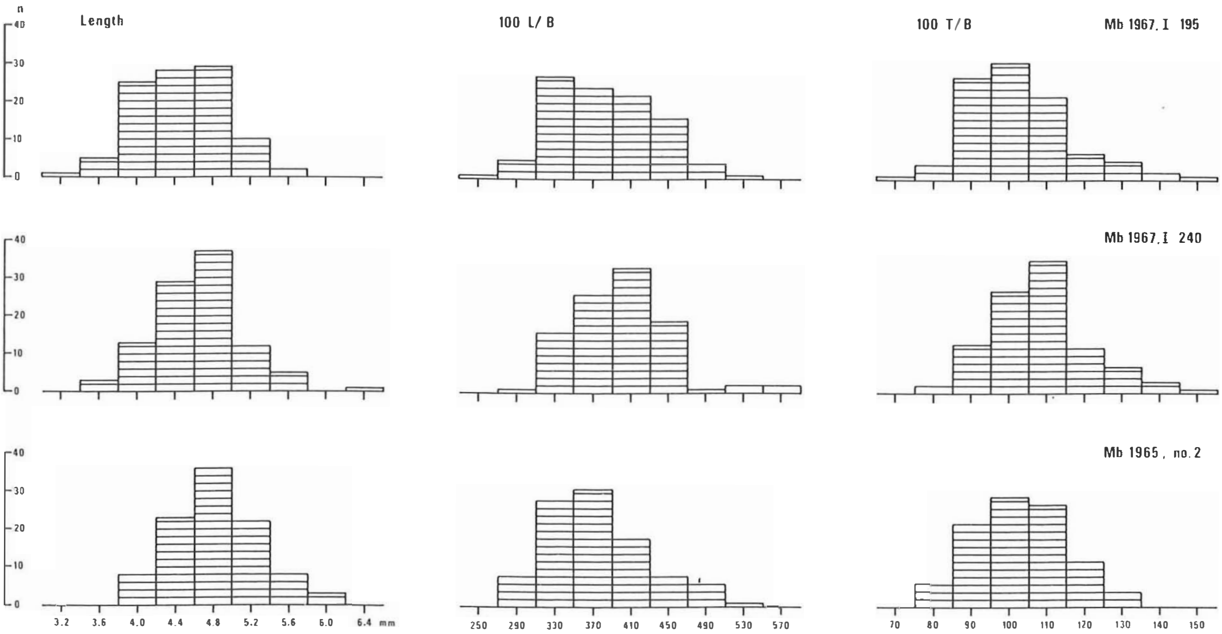

Fig. 10. Frequency distribution histograms for the length and index values of wild einkorn wheat grains.

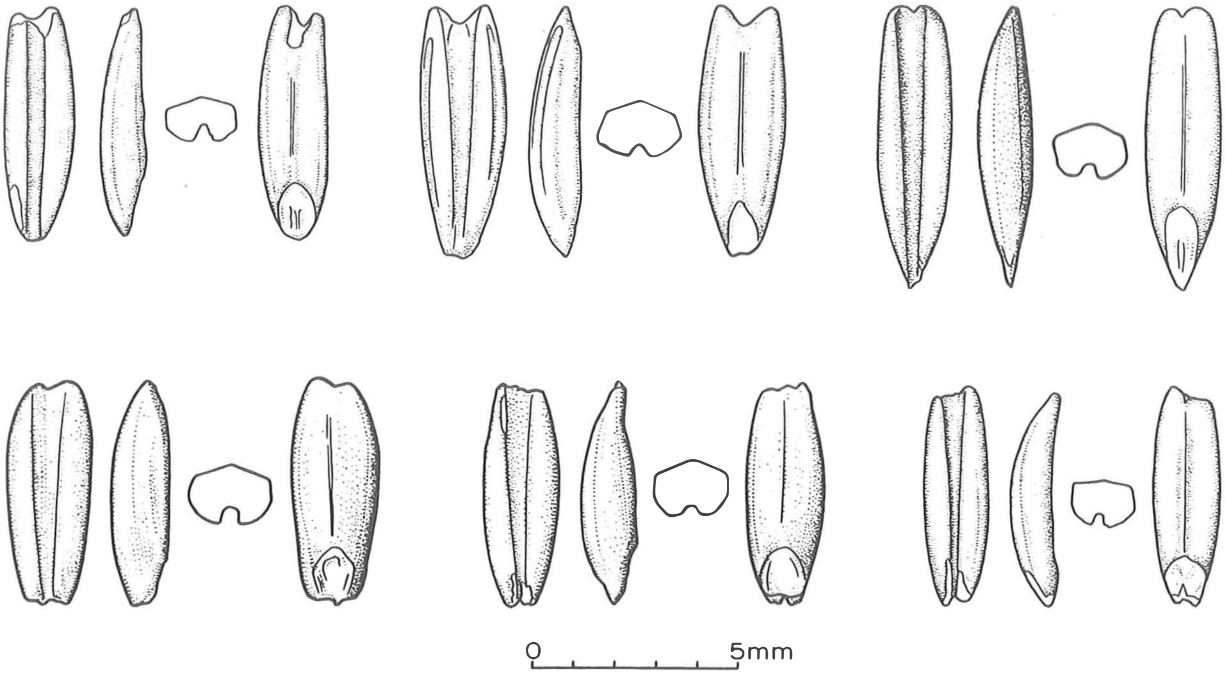

Fig. 11. *Hordeum spontaneum*, Mb'65, various samples (after van Zeist & Casparie, 1968).

are characterized by the rather flat dorsal side and by the small thickness. They are very thin at the apex as is particularly clear in lateral view (van Zeist & Bakker-Heeres, 1982(1985): fig. 18: 1-4).

The examination of the barley grains recovered in 1967 casted some doubt on the opinion that all two-rowed barley would be of *Hordeum spontaneum*. Some grains and grain fragments are much thicker than is usual in wild barley and the question was raised whether these could be of domestic *Hordeum distichum* L. emend. Lam. As has been mentioned in a previous paper, modern grains of *Hordeum spontaneum* and *H. distichum* are not difficult to separate (van Zeist & Bakker-Heeres, 1982(1985): figs. 18: 1-4 and 19: 1, 2, 3). However, in subfossil, charred grains this distinction is often less clear, due to puffing of the grain through carbonization. A further inspection of the *'distichum'*-type grains and grain fragments revealed that they had obviously been affected by the carbonization. None of the *'distichum'*-type grains turned out to be suitable for drawing because of more or less serious deformations. Consequently, it is assumed here, though with some reserve, that the Mureybit barley is of the morphologically-defined wild species. It cannot completely be ruled out that there is also some *Hordeum distichum*. It goes without saying that the presence of domestic two-rowed barley at Mureybit would not be without implications (see 4.3., 4.5.).

Drawings of wild barley-type grains from the 1965 campaign have already been published, but are shown again in figure 11. In addition, *Hordeum spontaneum*-type grains from one of the 1967 samples are illustrated in figure 12.

Six rachis internodes were found (Mb 1967, I 215 cm). These are definitely of the brittle-rachised type. They show an intact disarticulation scar and the base of the internodes is undamaged (fig. 7: 6).

The dimensions and index values of barley grains from phase III levels are presented in table 7. Mureybit lies within the distribution area of *Hordeum spontaneum* (Harlan & Zohary, 1966: fig. 1), though massive wild barley stands are not found here.

Hordeum vulgare. A hulled barley grain from Mb 1967, I 40-50 cm, has been attributed to domestic *Hordeum vulgare* L. emend. Lam. Although the grain (4.9×2.6×2.3 mm) is not twisted, its shape points to six-rowed barley. This grain may also be a later intrusion in the late-Palaeolithic levels (*cf.* the naked wheat kernel).

Bromus. Only one complete *Bromus* caryopsis and one half-caryopsis was recovered. We are concerned here with the rather narrow, oblong type described for Ramad (van Zeist & Bakker-Heeres, 1982(1985):

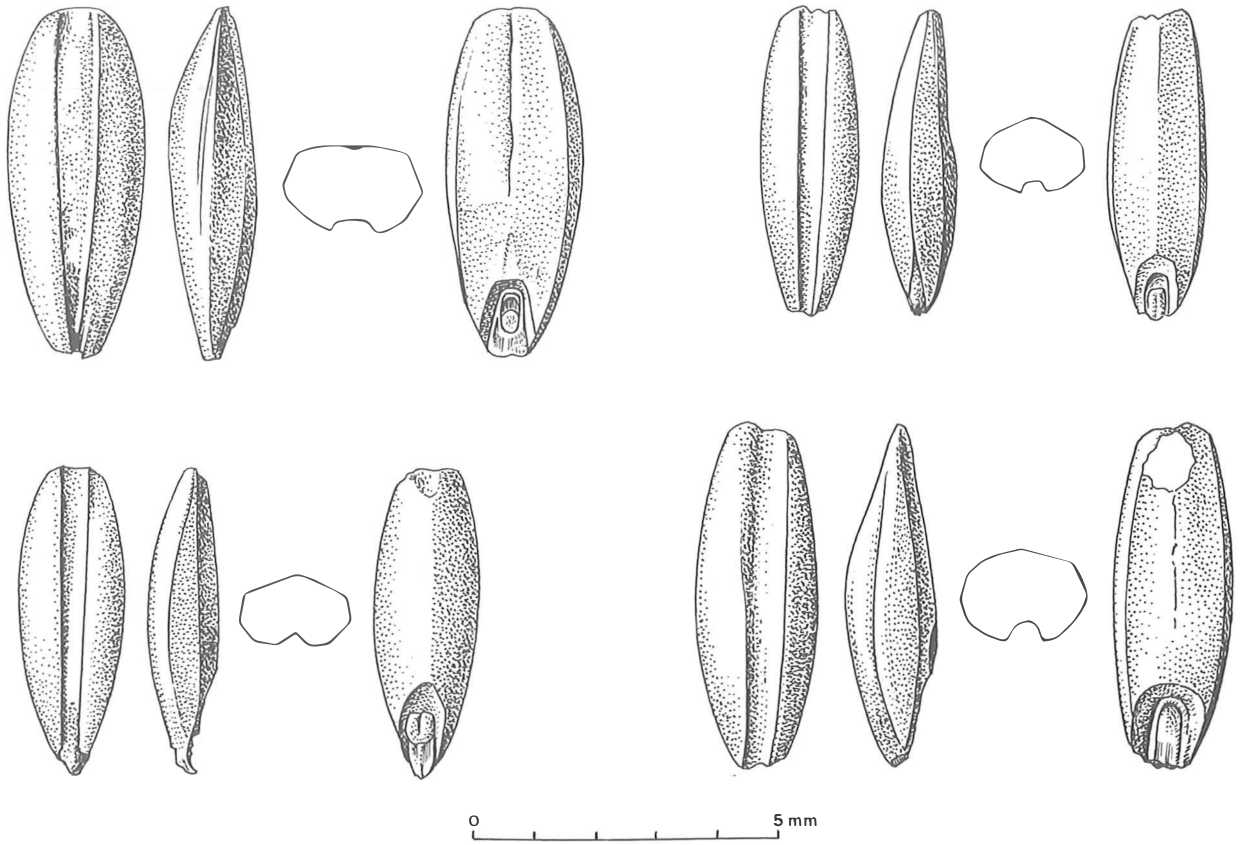

Fig. 12. *Hordeum spontaneum*, Mb'67, I 215.

Table 7. Dimensions and index values of *Hordeum (spontaneum)* grains.

		L	B	T	L/B	T/B
Mb 1967	Min.	5.0	1.8	1.4	234	67
I 180 cm	Aver.	5.81	2.23	1.68	262	75
N = 7	Max.	6.2	2.6	1.8	286	81
Mb 1967	Min.	4.9	1.7	1.1	227	56
I 215 cm	Aver.	5.46	2.09	1.48	263	71
N = 25	Max.	6.2	2.6	1.9	310	81
Mb 1967	Min.	4.6	1.6	1.2	233	63
I 240 cm	Aver.	5.44	2.07	1.49	264	72
N = 12	Max.	6.3	2.4	1.8	305	81
Mb 1967	Min.	4.6	1.8	1.0	215	55
I 265 cm	Aver.	5.46	2.14	1.52	256	71
N = 7	Max.	6.4	2.3	1.7	286	84
Mb 1965[1]	Min.	5.2	1.6	1.1	252	61
Various samples	Aver.	5.67	1.94	1.30	295	67
N = 7	Max.	6.7	2.1	1.6	372	76

1. The data for the 1965 barley grains differ from those in van Zeist (1970: table 3)[1] in that one of the measured specimens turned out to be *Hordeum* spec. and not *H.spontaneum*-type. The measurements of this grain have been left out here.

fig. 25: 2, table 30). The complete Mureybit *Bromus* fruit measures: 4.0×0.95 mm, L:B index 417.

Echinochloa. The fruits of *Echinochloa* are broadly elliptic to elliptic in outline (L:B index 116-156). The ventral side is flat, whereas the dorsal side is domed. The radicle shield extends over about ¾ of the dorsal side (fig. 7: 5). The majority of the *Echinochloa* caryopses is from sample Mb Q34/C1d (phase IB). For the dimensions see table 8.

Two *Echinochloa* species are reported for Syria, namely *E. crus-galli* (L.)P.B. and *E. colona* (L.)Link.

Eremopyrum. Characteristic of this lanceolate grass-fruit type is the longitudinal keel on the dorsal side (fig. 7: 3, 4). This type occurs in various phase I and II samples, but only in low numbers. Dimensions: see table 8.

Hordeum spec. This grass-fruit type, which has been described for Ramad, is attributed to a wild *Hordeum* species other than *H. spontaneum*. The fruits are rather flat, albeit somewhat swollen as a

Table 8. Dimensions and index values of various Gramineae species.

		L	B	T	L/B
Echinochloa					
Mb 1973	Min.	1.4	1.2	0.7	116
Q34/C1d (G5)	Aver.	1.81	1.32	0.82	129
N = 15	Max.	2.0	1.5	1.0	156
Setaria					
Mb 1973	Min.	1.4	0.9	0.5	158
Q34/C1d (G5)	Aver.	1.59	0.93	0.59	172
N = 8	Max.	1.7	1.0	0.7	200
Mb 1967	Min.	1.1	0.7	0.5	150
II 255 cm	Aver.	1.48	0.82	0.53	181
N = 11	Max.	1.7	1.0	0.7	210
Mb 1967	Min.	1.5	0.8	0.55	158
I 215 cm	Aver.	1.57	0.86	0.60	183
N = 8	Max.	1.7	1.0	0.65	200
Mb 1967	Min.	1.3	0.8	0.5	145
I 240 cm	Aver.	1.49	0.87	0.55	172
N = 7	Max.	1.7	0.9	0.6	210
Eremopyrum					
Mb 1973, Q32/E1c (G4)		2.5	0.8	0.7	310
		2.6	0.7	0.8	356
Mb 1973, Q34/C1d (G5)		2.6	0.7	0.6	367
Mb 1967, II 170 cm		3.5	0.9	0.8	400
Mb 1967, II 205 cm		2.2	0.7	0.6	311
Mb 1972, Q33 (no. 2)		2.8	0.8	0.7	350
Mb 1973, Q34/C1c (G6)		2.3	0.9	0.7	264
Mb 1973, Q34/B2c (G9)		3.0	0.8	0.7	370
Hordeum spec.					
Mb 1973, Q34/C1d (G5)		4.4	1.4	1.2	324
Mb 1972, Q33/B1 (G2)		3.4	1.1	1.0	307
Mb 1967, I 130 cm		3.7	1.2	1.0	307
		3.5	1.2	1.0	293
Mb 1967, I 195 cm		4.2	1.6	1.2	265
Mb 1965, Q30/XIII-XIV (no. 6)		3.8	1.5	1.0	247

result of the carbonization, and the apical end is truncated (fig. 7: 1, 2). Dimensions: see table 8.

Setaria-type. The caryopses of this type are more slender than those of *Echinochloa*. The fruits are elliptic in outline (L:B index 145-210), with flat ventral side and slightly domed dorsal side. The radicle shield extends over ½ to ⅗ of the dorsal side (fig. 7: 7, 8). The dimensions are shown in table 8. Shape and size of the caryopses conform to those of *Setaria verticillata* (L.)P.B. in the B.A.I. seed reference collection, but a *Digitaria* species cannot be excluded.

Unidentified Gramineae. Some grass fruits could not be identified because of poor preservation, but this category includes also well preserved, small caryopses, for which no matching types are present in the seed reference collection. *Lolium* and *Phalaris* are conspicuously absent from the Mureybit charred seed record.

3.13. Juncaceae

Juncus. Mb 1965, no. 2, yielded a large number of *Juncus* seeds baked together into lumps of hundreds of seeds. The seeds are about 0.4 mm long. In the paper on the seeds and fruits recovered in 1965 (van Zeist, 1970) it is suggested that the seeds are of *Juncus bufonius* L., a low, slender rush species from damp, open ground. However they could also be of *Juncus acutus* L., a stout and rigid species from brackish soils. The surface structure of *Juncus* seeds allows, to a certain extent, a species identification.

3.14. Labiatae

Micromeria. Small fruits, oblong to elliptic to somewhat obovate in outline, with roof-shaped ventral side and rounded apical end (fig. 5: 12, 13). Dimensions: 0.9-1.0×0.5 mm. The Mureybit fruits resemble those of *Micromeria graeca* Benth. in the seed reference collection. Various *Micromeria* species are reported for Syria (Mouterde, vol. 3: pp. 174-178).

Ziziphora. Two *Ziziphora* fruits were found (1.3×0.6 and 1.25×0.55 mm). Fruits obovate in outline, apical end rounded, pointed at the base, with conspicuous basal depressions (fig. 5: 11). *Ziziphora capitata* L. and *Z. tenuior* L. are common in lowland Syria (Mouterde, vol. 3: pp. 181-182).

3.15. Leguminosae

Astragalus. *Astragalus* is very well represented at Mureybit; a few samples yielded quite considerable numbers of seeds of this type. The seeds display the usual variation in size and shape (van Zeist & Bakker-Heeres, 1982(1985): fig. 28: 7, 8). The dimensions are shown in table 9. The length is the side with the hilar notch. *Astragalus* species are common constituents of steppe vegetation.

Lens (lentil). Lentils occur most frequently in the phase III and IV samples. There are no significant differences in the greatest dimension of the lentils between phases II, III and IV (table 10). The size class of the Mureybit lentils, from 1.7 to 2.9 mm, corresponds to that of wild lentil, *Lens orientalis* (Boiss.)Hand.-Mazz., the seeds of which are 2.5-3.0 mm in diameter (Zohary, 1972). *Lens orientalis* is at present considered as the most likely ancestor of domestic lentil (*Lens culinaris* Medik.). Mureybit lies very close to the present-day distribu-

Table 9. Dimensions of *Astragalus* seeds.

		L	B
Mb 1973	Min.	1.2	1.1
Q32/E1c (G4)	Aver.	1.58	1.32
N = 8	Max.	1.9	1.6
Mb 1973	Min.	1.2	1.0
Q34/C1d (G5)	Aver.	1.75	1.22
N = 18	Max.	2.4	1.5
Mb 1973	Min.	1.1	1.0
Q34/C1c (G6)	Aver.	1.55	1.23
N = 12	Max.	1.8	1.5
Mb 1973	Min.	0.9	1.1
Q34/C1b (G7)	Aver.	1.50	1.30
N = 28	Max.	2.2	1.5
Mb 1973	Min.	0.9	1.0
Q34/C1 (G8)	Aver.	1.52	1.31
N = 25	Max.	2.0	1.6
Mb 1967	Min.	1.2	1.2
II 115 cm	Aver.	1.76	1.32
N = 9	Max.	2.1	1.5

Table 10. Greatest dimension of *Lens*.

	Min.	Aver.	Max.
Phase II (N = 5)	2.4	2.50	2.6
Phase III (N = 28)	1.8	2.35	2.9
Phase IV (N = 8)	1.7	2.43	2.9

tion area of *Lens orientalis* (Zohary & Hopf, 1973: map 4).

The dimensions of the Mureybit lentils do not provide a clue to the question whether or not this species was cultivated by the inhabitants of the site. The Mureybit lentils are smaller than those at Ramad, for which site there is no doubt that the species was cultivated. At Aswad, with smaller mean values than at Ramad, comparatively large specimens, with a diameter of more than 3 mm, occur, whereas at Mureybit none of the lentils measures more than 2.9 mm. If lentil was grown by the Mureybit people did this not result in an increase in size.

Pisum (field pea). The distinction between small peas and large vetch (*Vicia*) seeds had to be arbitrary because the hilum had not been preserved. Pea-like seeds with a greatest dimension of at least 2.4 mm have been attributed to *Pisum*. It should be admitted that for the Neolithic sites in the Damascus basin the dividing line has been laid at 2.9-3.0 mm (van Zeist & Bakker-Heeres, 1982 (1985): 4.10.). As some of the smaller peas may actually be vetches and as a few large pea-like seeds had seriously been deformed, this type is indicated in tables 2 and 3 as (*cf.*) *Pisum*. Some of the large specimens measure 4.5-5.0 mm.

No remains of the seed wall are present, so the seeds themselves do not indicate whether wild or domestic field pea is concerned here. The present-day distribution area of *Pisum humile* Boiss. et Noë, the assumed wild progenitor of domesticated *Pisum sativum* L., approaches very closely the Mureybit area (Zohary & Hopf, 1973: map 2).

Other leguminous seed types. One seed of *Lathyrus* cf. *cicera* L. (4.0×3.0×4.0 mm) was recovered from Mb 1967, II 300 cm. It is a terminal seed, that is to say, a seed from the end of the pod. Terminal *Lathyrus* seeds are conical in shape with a rounded or bluntly pointed apex and a triangular base.

The samples collected in 1965 (phase III) yielded a few *Vicia ervilia* (L.)Willd. (bitter vetch) seeds, two of which were suitable for measuring (2.1×2.2×2.2 and 1.7×1.7×1.5 mm). *Vicia* spec. is scarce at Mureybit.

A small number of seeds have been attributed to *Medicago*, a few of them with some reserve. The length of 6 seeds ranges from 1.8 to 2.9 mm. A few *Trigonella astroites*-type seeds were found (see van Zeist & Bakker-Heeres, 1982(1985): fig. 28: 2, 3).

The *Trigonella*-type is somewhat enigmatic in that it is not certain that the seeds of this type are indeed of *Trigonella*. The seeds are elliptic in outline, with rounded upper and lower ends (fig. 5: 7). Length of 7 seeds: 1.9 to 2.7 mm. A similar type has been established for Ganj Dareh Tepe in Iran (van Zeist *et al.*, in prep.).

3.16. Linaceae

Linum. Three more or less poorly preserved *Linum* seeds were found. The dimensions (2.4×1.2 and 2.3×1.0 mm) clearly point to a wild flax species. Whether this is *Linum bienne* Mill. or another wild *Linum* species must be left undecided. It is not likely that linseeds were collected intensively by the inhabitants of the site.

3.17. Liliaceae

Asparagus. Hemispherical to compressed hemispherical seeds with a broadly elliptic hilar scar at the base. Parts of the finely granular seed wall are still preserved in some of the seeds. In most specimens a hole is visible which runs diagonally through the seed (fig. 5: 15). Rather often the charred remains of the baculiform embryo are still present in this hole. For the dimensions see table 11.

Table 11. Dimensions of *Asparagus* seeds.

		L	B
Mb 1973	Min.	2.4	1.7
Q33/B4 (G1)	Aver.	3.03	2.04
N = 48	Max.	3.7	2.6
Mb 1972	Min.	2.4	1.5
Q33/B4 (no. 7)	Aver.	2.87	1.93
N = 22	Max.	3.4	2.2

Table 12. Dimensions of *Polygonum venantianum*-type fruits.

		L	B
Mb 1973	Min.	1.2	0.7
Q33/B4 (G1)	Aver.	1.56	0.98
N = 39	Max.	1.9	1.3
Mb 1967	Min.	1.1	0.6
II 255 cm	Aver.	1.34	0.83
N = 100	Max.	1.8	1.0

The seeds compare rather well with those of *Asparagus officinalis* L. and not with those of *A. stipularis* Forsk., which *Asparagus* species are represented in the seed reference collection. As *A. officinalis* does not form part of the indigenous flora of Syria, another species must be concerned at Mureybit.

Asparagus seeds are rather frequent in phase I samples, but they are conspicuously absent from phase III and IV samples. This seed type has not yet been reported for other Near Eastern archaeological sites.

Bellevalia. A small number of *Bellevalia* seeds (van Zeist & Bakker-Heeres, 1982(1985): fig. 24: 10) was recovered. A few *Bellevalia* species are reported for steppe vegetations (Mouterde, vol. 1: pp. 248-250).

3.18. Malvaceae

Malva. The Mureybit specimens have a domed dorsal face, suggesting that they could be of *Malva aegyptica* L. Dimensions: c. 1.5×1.6×1.1 mm.

3.19. Moraceae

Ficus. Remains of *Ficus* are confined to altogether 3 pips (c. 1.3×1.0 mm) and a basal part of a fruit, diameter 6 mm (in Mb 1967, I 130 cm). It is not likely that the scarcity of fig pips is due to the field processing of the soil samples. Various other seed types of about the same dimensions have been recovered, sometimes in great numbers (*cf. Polygonum*).

3.20. Papaveraceae

Fumaria. The *Fumaria* fruits at Mureybit correspond to those recovered from Ramad (van Zeist & Bakker-Heeres, 1982(1985): fig. 30: 2). The Mureybit specimens measure 1.75×1.8, 1.6×1.75, 1.6×1.6 and 1.45×1.6 mm. The fruits show most resemblance to those of *Fumaria densiflora* DC.

3.21. Polygonaceae

Polygonum venantianum-type. The triquetrous *Polygonum* nutlets (fig. 5: 8) are very common at Mureybit. In only a few samples this fruit type is not represented and some samples yielded considerable numbers of *Polygonum* fruits. For the dimensions see table 12.

As has already been set forth in a previous paper, the correct name of this fruit type is still problematic. The identification as *P. venantianum* is based upon the resemblance to the fruits of a species which, following Mouterde (vol. 1: p. 401), has been identified as *P. venantianum* Clem. However, according to other authorities this would be an incorrect name. The *P. venantianum* fruit type from Mureybit corresponds to the *P. corrigioloides*-type reported for Abu Hureyra by Hillman (1975). The charred seed record suggests that the *Polygonum* species concerned (of the *aviculare* section) must have been quite common in the vicinity of the site.

3.22. Portulacaceae

Portulaca. Three damaged *Portulaca* seeds were recovered. The flattened seeds are almost circular in outline with a distinctly projected tip of the radicle. The surface is covered with concentric rows of warty papillae. The size is about 0.8×0.7 mm. *Portulaca* is a species from ditches and wet ground (Post & Dinsmore, 1932: p. 220). This species would have found suitable habitats in the Euphrates flood plain.

3.23. Potamogetonaceae

Potamogeton. The only *Potamogeton* fruit from Mureybit (Mb 1967, II 225 cm) shows much resemblance to the fruits of *P. pusillus* L., which species is, however, not reported for Syria (Mouterde, vol. 1: pp. 26-28). The flattened fruit (1.9×1.3×0.8 mm) is obliquely elliptic in outline, with pointed upper end and truncated base (fig. 5: 6). Pondweed must have been found in the Euphrates, particularly in relict channels.

3.24. Primulaceae

Androsace maxima. For the description and illustration of this seed type, see van Zeist & Bakker-Heeres (1982(1985): 5.22., fig. 30: 8). Eight samples each yielded one *Androsace* seed.

3.25. Ranunculaceae

Adonis. As at Ramad, two size classes of *Adonis*-type fruits can be distinguished here. The larger fruits measure c. 2.7×2.6×1.7 mm and those of the smaller type c. 2.0×1.7×1.5 mm. See also van Zeist & Bakker-Heeres (1982(1985): fig. 30: 9, 10). Only a small number of *Adonis* fruits was found at Mureybit.

3.26. Rubiaceae

Galium. The hemispherical *Galium* fruits at Mureybit are, on average, considerably smaller than those at Ramad. The greatest dimension of 51 specimens from Mb 1967, I 130 cm, varies from 0.7 to 1.4 mm, with a mean value of 0.99 mm. For Ramad these values are 1.2, 3.0 and 2.14 mm, respectively. It must be left undecided whether or not more than one *Galium* species is concerned here. Most of the fruits show a finely reticulate surface pattern.

The two *Galium* fruits from Mb 1974, G1 (phase IV) differ from the others in that they are distinctly larger, namely 3.0 and 2.4 mm. They are more of the *Galium aparine/tricornutum*-type.

3.27. Solanaceae

Solanum-type. Three *Solanum*-type seeds were found. The flat seeds are oval in outline. Surface finely reticulate with wavy muri. Two seeds are strongly reminiscent of *Solanum nigrum* L. seeds (Mb 1965, no. 7: 1.6×1.3 mm; Mb 1967, II 215 cm: 1.7×1.4 mm). For the other specimen no matching type is present in the seed reference collection (Mb 1973, G2: 1.7×1.3 mm).

3.28. Thymelaeaceae

Thymelaea. One drop-shaped fruit of *Thymelaea* (2.2×1.2 mm) was found (Mb 1967, I 320 cm). This fruit type is depicted in van Zeist & Buitenhuis (1983: fig. 10: 7).

3.29. Charcoal identifications

From the samples collected in 1965 pieces of charcoal large enough to allow a species identification were recovered. Most of the charred wood is of poplar, *Populus* (*euphratica*), total volume 46 cc. The volume of tamarisk (*Tamarix*) charcoal amounts to 6 cc and that of ash (*Fraxinus* cf. *syriaca*) to 2 cc. In addition, one sample yielded a few pieces of a rosaceous wood type.

4. DISCUSSION

So far very few pre-Neolithic sites have yielded charred plant remains other than charcoal. From the rather great numbers of seeds and fruits recovered from Mureybit one could have nourished great hopes with respect to the prospects of obtaining information on the vegetation in the vicinity of the site, on the plant husbandry and on possible changes in the composition and/or exploitation of the wild flora in the course of the habitation. Unfortunately, the plant remains do not allow the kind of conclusions one may have hoped for and many questions remain unsolved. This may at least in part be due to the way the samples were collected. For obtaining information on possible differences in the composition of the plant remains in different features and activity areas, an adequate sampling strategy should have been applied. On the other hand, one should perhaps be increasingly more reticent in attempting to interpret archaeobotanical data in terms of particular activities of prehistoric man according as the site concerned dates from an older period. The final report on the botany of Abu Hureyra, which site has been sampled systematically for plant remains, should show to what extent this point of view is too pessimistic. The above by no means implies that the Mureybit seeds and fruits would not give occasion to comments.

4.1. Seed frequencies

For the sites of Aswad, Ghoraifé, Ramad and Ras Shamra the seed concentrations, expressed as seed frequencies per 10 litres of soil, have been determined. There can be marked differences in average numbers of seeds and fruits per volume of soil between sites, between phases within one site and even between areas of one site. It is self-evident that seed concentrations can only be determined if the volumes of soil that have been floated are approximately known. For Mureybit this is the case only for the samples collected in 1967 (series I and II). It is true that at the time the volumes of soil were not determined, but this must have been about 10 litres (one bucket) and, what is important for a comparison between both localities, the volumes were about the same for each sample. Table 13 shows in the first place the total numbers of seeds and fruits found in the samples from series I and II and the average numbers per sample (of approximately 10 litres of soil). As sample II 255 cm yielded an anomalously large number of *Polygonum* fruits (see table 2), total and average numbers

Table 13. Numbers of seeds and fruits in Mb 1967 series I and II (for explanation, see 4.1.).

	No. of samples	Total no. of seeds	Meanper sample (of 101)	Total no. minus barley & wheat	Mean per sample
Series II					
(phase II)	15	1 613	107.5	–	–
	14	931	66.5	926	66.1
Series I					
(phase III)	13	2 438	187.5	782	60.2

of seeds and of fruits of series II are also shown with this sample being excluded. The average number of seeds and fruits in the series I samples (phase III) is markedly higher than that of series II (phase II). A closer inspection of tables 2 and 3 reveals that this difference in seed concentration between the phase II and III deposits is completely accounted for by the einkorn wheat and barley frequencies. If the numbers of cereal grains are excluded from the calculations, one arrives at about equal average numbers of seeds and fruits for both series (60.2 and 66.1, respectively). This is already an important result because it demonstrates that the high wild cereal grain proportions in phase III are due to a greatly increased influx of these fruits and not to a decrease of the other seed and fruit types. During phase III, wild cereals must have played an important part in the economy of the site.

4.2. Comparison between phases

For the evaluation of the Mureybit plant remains a comparison between the various habitation phases could be of some use. As of many samples (those from 1965, 1972, 1973, 1974) the soil volume is not known, a comparison can only take place on the basis of the proportions. To that end, for groups of samples, such as indicated in tables 2 and 3, the total numbers of seeds and fruits per type and per group were determined and thereupon the percentages were calculated. No percentages were determined for the 1965 samples because some of them were hand-picked and because there is the suspicion that the recovery of the flotation samples of that year is not wholly comparable to that of the other samples (see 2.). In tables 14 and 15 the percentages are presented for a selected number of types. With respect to these relative frequencies, the following should yet be remarked.

For the calculation of the percentages for series II (phase II) the sample with the anomalously high *Polygonum* frequency (255 cm) has again been left aside. The values for *Hordeum spontaneum* and *Triticum boeoticum* are expressed as percentages of the total numbers of seeds and fruits per group of samples (table 15). However, for the calculation of the percentages of the other seed and fruit types (table 14), the cereals are left out of the sum upon which these frequencies are based. This is done because otherwise the values of the series I (phase III) seed types would have been depressed too much by those of wild einkorn wheat and barley. The relative frequencies should provide information on possible changes in the proportions of seeds and fruits that arrived on the site, which changes could be due either to natural or man-induced alterations of the vegetation or to changes in the exploitation of the flora by the inhabitants of the site. It should be noted that a few rare grass and leguminous seed types are not listed in table 14, but that the total percentages for these families do include these types.

The wild cereal species will come up for discussion in sections 4.3. and 4.5. In section 4.6. attention will be paid to the plant growth in the vicinity of the site as this is attested in the charred seed record. In this section the discussion of table 14 will remain confined to a few comments of more general nature. The table shows marked differences in the seed and fruit percentages between the groups of samples, but it is still problematical what these differences may mean. In this connection it is significant that between both groups of phase II samples the differences are at least as great as those between phases. Some of the striking differences between both phase II groups relate to the proportions for *Arnebia decumbens*, Chenopodiaceae, *Astragalus*, *Capparis* and *Polygonum*. As the samples must be largely from the same period, the differences in seed content cannot be the result of differences in the regional vegetation. Consequently, the differences concerned have to be ascribed to the action of man. It is unlikely that these differences are the reflection of different activity areas. One may expect that in the course of 100 to 200 years (the duration of phase II) certain activities were not always carried out at the same place, but that they moved around somewhat. As for the Boraginaceae, it cannot be excluded that burrowing animals, such as ants, are responsible for the deposition of at least part of the nutlets (*cf.* van Zeist & Bakker-Heeres, 1982(1985): 5.3.), but that does not explain either why *Arnebia decumbens* is quite numerous in the 1972/73 phase II samples and rather scarce in those of series II. The authors feel unable to present a reasonable explanation for the marked differences in mean seed and fruit percentages in both groups of phase II samples. However, it will be clear that if already between groups of samples from the same habitation phase such dif-

Table 14. Percentages of various seed and fruit types per group of samples (for explanation, see 4.2.).

Phase	IA 1972 + 1973	II Series II	II 1972 + 1973	III Series I	IVA 1974
Arnebia decumbens	15.2	1.7	25.4	4.9	30.4
Arnebia linearifolia	0.4	0.3	0.3	0.6	0.7
Heliotropium	0.1	0.1	0.3	0.1	–
Lithospermum arvense	0.5	–	0.1	0.6	–
Lithospermum tenuiflorum	5.4	20.1	17.5	16.5	19.3
Σ Boraginaceae	21.6	22.2	43.6	22.8	50.4
Atriplex-type	0.7	1.9	0.4	–	–
Chenopodium album-type	0.1	1.6	0.1	–	–
Suaeda	0.9	1.2	–	1.4	–
Σ Chenopodiaceae	1.7	4.8	0.6	1.4	–
Echinochloa	0.1	0.3	0.6	–	–
Eremopyrum	0.6	0.8	0.9	0.1	–
Hordeum spec.	–	0.2	0.1	0.9	–
Setaria-type	0.2	1.0	0.1	4.3	–
Unidentified Gramineae	0.6	0.2	1.6	0.4	3.0
Σ Gramineae	1.6	2.5	3.4	5.8	3.0
Astragalus	4.9	3.7	21.2	1.3	17.8
Lens	–	0.3	0.4	1.2	5.9
Medicago	0.2	0.1	0.1	–	2.2
(cf.) Pisum	0.1	0.3	0.4	0.3	1.5
Trigonella-type	0.5	0.1	0.3	0.1	–
Trigonella astroites-type	–	0.1	0.3	–	–
Unidentified Leguminosae	0.1	0.1	–	0.1	0.7
Σ Leguminosae	5.9	4.9	22.9	3.2	28.9
Asparagus	20.2	0.7	–	–	–
Capparis	1.2	1.8	12.6	1.7	0.7
Centaurea	0.3	0.1	0.3	1.9	0.7
Galium	–	1.4	1.0	14.1	2.2
Polygonum	36.8	54.0	7.3	35.4	0.7
Scirpus maritimus	5.1	0.9	2.2	1.9	3.0
Silene/Gypsophila	0.2	1.8	0.9	3.8	–
Number of samples	10	14	8	13	4
Sum of seeds and fruits	810	926	669	782	135

ferences occur, one should be extremely cautious in considering differences between phases as indications of changes in the vegetation in the vicinity of the site. For that reason, in the discussion of section 4.6. the data of the various phases will be taken together, although one must assume that some changes in the vegetation took place in the course of 1000 years.

4.3. Current views on the plant husbandry

The question of the nature of the plant husbandry of the late-Palaeolithic inhabitants of Mureybit (and Abu Hureyra) has come up for discussion in various papers. The opinions brought forward will briefly be reviewed here. In the publication on the wild cereals from Mureybit, van Zeist & Casparie (1968) assume that the wild einkorn was gathered in the adjacent part of Turkey, at about 100 to 150 km from the site. This assumption was based on the fact that at present wild einkorn is not found in the plain of northern Syria, whereas it grows in massive stands in southeastern Turkey, at elevations between 600 and 2000 m (Harlan & Zohary, 1966). The palynological evidence available at that time did not provide indications of a possible moister climate of northern Syria about 10,000 years ago, which could have induced a more southward extension of wild einkorn stands. Wild barley could have been harvested more in the vicinity of the site, in which case the so-called wadi race should have been concerned.

In his preliminary report on the vegetable remains from Abu Hureyra, Hillman (1975) suggests three possible sources for the wild einkorn wheat, *viz.* (1) natural stands in the vicinity of the site, (2) the gathering of this wild cereal at a greater distance, and (3) its cultivation by the inhabitants. As for the first hypothesis, Hillman mentions that he did not find one habitat in the area where under present-day conditions wild einkorn could conceivably grow. Hillman wonders whether transportation of the grain over a great distance would not have presented too many difficulties to be a realistic hypothesis. The cultivation of morphologically wild-type einkorn for a long time (third hypothesis) would not necessarily have resulted in a perceptible change in the morphology of the plant (and the fruit). This would have depended on the agricultural practices applied, such as field rotation, duration of fallows and harvesting techniques.

The pollen record obtained by Leroi-Gourhan (1974) for a few series of samples from tell sections exposed by the excavation shows a considerable increase in Cerealia-type pollen in phase III levels (S32 square). Values of up to 8% of Cerealia-type pollen would imply that wild cereals were quite numerous around the tell. Leroi-Gourhan suggests a kind of 'proto-agriculture', in which the growth of the wild plant species was favoured by means of watering and weeding. The hypothesis of a proto-agricultural stage at Mureybit was adopted by Cauvin (1977). The animal bones suggest a greater hunting productivity in phase III brought about by an increase in the proportion of large mammals among the hunted animals (Ducos, 1975; 1978: pp. 120-129). Thus, the shift in the exploitation of food resources would have involved plants as well as animals.

Moore (1979) goes a step further and claims the intentional growing of wild cereals by the Mesolithic (late-Palaeolithic) inhabitants of Abu Hureyra. Moore does not provide evidence additional to the plant remains which could support his conclusion of plant cultivation.

4.4. Final Pleistocene and early Holocene climate

Since 1970, after the publication of the report on the plant remains of the 1965 Mureybit campaign, information on the final Pleistocene and early Holocene climate of northern Syria has been obtained. Evidence of a moister climate around 10,000 B.P. comes along different lines.

A long pollen sequence has been prepared for sediment cores from the Orontes valley (the Ghab valley) in northwestern Syria (Niklewski & van Zeist, 1970; van Zeist & Woldring, 1980). In the pollen diagram presented in van Zeist & Woldring (1980: figs. 2 and 3), which is a combination of three pollen sequences, the highest tree-pollen values are observed in the local pollen zones 2 and 3. The pollen record suggests a maximum expansion of forest in the final stage of the Late-glacial and in the early stages of the Holocene, in the period between 9000 and 7000-6000 B.C. The zone 2/3 transition is radiocarbon dated to 8130 ± 55 B.C. The maximum tree pollen values in zones 2 and 3 suggest that the climate of that time must have been appreciably moister than that of today.

The pollen diagram prepared by Leroi-Gourhan (1974) for the occupational deposits of tell Mureybit (see above) shows a small increase in tree-pollen percentages in phase III levels, which increase is nearly exclusively brought about by *Pinus* (pine). The arboreal pollen values are too low to conclude the presence of trees in the vicinity of the site, but forest vegetations may at least have come nearer to the Mureybit area. This expansion of forest would have been the result of an increase in humidity around 8000 B.C.

From the distribution of sites in the Levant in 'later Mesolithic times' (tenth and ninth millennia B.C.) Moore (1979) concludes that at that time rainfall must have been abundant, resulting in an eastward expansion of the Mediterranean forest zone. In the late seventh millennium B.C. the environment became less attractive because of increased aridity as is suggested by the pattern of settlement.

In summary, it seems justified to conclude that around 8000 B.C. the climate of North Syria was moister than that of today. The moister climatic conditions may possibly have resulted in the presence of wild einkorn wheat stands in the area of Mureybit and Abu Hureyra, while wild barley may have been much more common than at present, being confined to wadi beds.

4.5. The role of wild cereals

Assuming that at the time wild einkorn wheat stands occurred in northern Syria, the question arises whether during the whole of the late-Palaeolithic (Mesolithic) habitation of Mureybit (and Abu Hureyra), covering a period of about 1500-2000 years (see 1.4.), conditions were favourable for this cereal species or whether this was the case only during a rather short period. The Ghab pollen evidence and the later Mesolithic settlement pattern point to a rather long period of increased humidity, implying a possible occurrence of wild einkorn wheat in northern Syria during the last phase of the Late-glacial and the early Holocene. On the other hand, the Mureybit pollen record suggests that humidity did not increase until phase III levels, after 8000 B.C. The increase in Cerealia-type pollen values is synchronous with the rise in the pine pollen curve. Is the increase in Cerealia-type pollen values the reflection of a considerable expansion of wild cereals in the vicinity of the site

Table 15. Percentages of wild einkorn and barley per group of samples (for explanation, see 4.2.).

Phase	IA 1972 + 1973	II Series II	II 1972 + 1973	III Series I	IVA 1974
Triticum boeoticum	1.5	0.3	0.7	59.2	4.8
Hordeum spontaneum	0.3	0.1	0.1	8.7	2.1
Number of samples	10	14	8	13	4
Sum of seeds and fruits	824½	931	674½	2438	145

which was related to a (further) increase in humidity? Was the assumed expansion of wild cereals a natural phenomenon, in other words, did wild cereals play a more prominent part in the natural vegetation as a result of more favourable climatic conditions, or was the increase of wild cereals occasioned by manipulations of the inhabitants of the site, by proto-agricultural or agricultural practices?

The pollen evidence seems to be corroborated by the charred seed record in that wild einkorn wheat and wild barley grains are scarce in phase I and II levels, whereas in phase III they show high proportions (table 15). This could be due to a much more frequent occurrence of both wild cereals in the vicinity of the site, but it is also possible that it was not until phase III that the collecting of wild cereals became an important activity or that the cultivation of these wild crop plants started. According to Leroi-Gourhan (1974) the comparatively high Cerealia-type pollen percentages in phase III levels point to a frequent occurrence of wild cereals in the vicinity of the site. Van Zeist & Woldring (1980) find it unlikely that, assuming that the Cerealia-type pollen originated already from wild cereals and not from another wild grass species, such large numbers of this pollen type were blown in. Wild and cultivated barley and wheat have a very poor pollen dispersal because they are self-pollinating species. Van Zeist & Woldring wonder whether the high frequencies of Cerealia-type pollen could have been occasioned by the threshing of cereals on the site. However, this suggestion is invalidated by the fact that of wild einkorn wheat no threshing remains have been found at all and of wild barley only 6 rachis internodes (in Mb 1967, I 215 cm). The archaeobotanical evidence suggests that threshing was not carried out on the site.

The above would imply that the processing of the cereal crop up to the stage that the grains were ready for food preparation was done elsewhere, outside the settlement. This leads again to the hypothesis that the wild cereals were harvested at a considerable distance from the site. To facilitate transportation the volume of the crop was reduced to a minimum in the harvesting area, at the camp site of the grain harvesters. Admittedly this is speculation based upon negative evidence. However, from the above and from 4.3. it will be clear that the origin and the nature of the wild cereal grains at Mureybit (and Abu Hureyra) are still problematical:

– Did stands of wild einkorn wheat occur in the vicinity of Mureybit (and Abu Hureyra) and if so, were they quite extensive only during phase III times?

– Were wild cereals cultivated or at least manipulated by the inhabitants of the sites?

– If wild cereals were quite common in the vicinity of the site – either wild or (semi-)cultivated – how can it be explained that einkorn wheat spikelet remains are virtually absent?

– The Cerealia-type pollen at Mureybit could have originated from grasses other than wild cereals, so that the rather high frequencies of this pollen type are not necessarily in conflict with the hypothesis that the einkorn wheat was harvested in the wild at quite some distance.

As long as no more conclusive evidence in favour of one of the hypotheses brought forward can be presented, it may be wise to refrain from any firm conclusions in this respect.

In the phase IVA samples the proportions of the wild cereals are again much lower than in phase III. However, in view of the small number of samples, one should be cautious in drawing conclusions from the phase IVA seed record.

4.6. The vegetation in the vicinity of the site

The wild plants will be considered here from two points of view. It will be examined to what extent they inform us on the vegetation in the Mureybit area. Besides, their potential role in the economy of the site will be reviewed (4.8.). As on both aspects very little can be said without becoming too speculative, the discussion must remain confined to a few remarks and suggestions, however unsatisfactory this may be in view of the great amount of time and effort invested in the examination of the plant remains. As has already been mentioned (4.2.), in this discussion the results of all samples have been combined.

Except for some unknown types, less than 60 seed and fruit types of wild plant taxa have been established for Mureybit. The charcoal identifications add three more species. It will be clear that these taxa include only a proportion of the species that were found in the area at the time. This is, in itself, no great surprise as by far the majority of the seeds and fruits must have arrived in the settlement through the action of man. This implies already some kind of selection of the species represented in the seed record. There were no domestic animals which could have carried in seeds and fruits, either adhering to the skin or in the digestive tract. In evaluating the Mureybit charred seed record, it is natural to include the plant remains from the Mesolithic deposits at Abu Hureyra in the discussion. So far, only preliminary results of the botanical examination of Mesolithic and Neolithic levels at Abu Hureyra have been published (Hillman, 1975: see p. 71). In spite of the incompleteness of the plant list published for Mesolithic Abu Hureyra, some striking differences with the Mureybit plant remains are already evident (see below).

Two major ecosystems can be distinguished in the Mureybit area, *viz.* the periodically flooded Euphrates valley and the dry uplands. Under the prevailing climatic conditions, steppe constitutes the natural vegetation of the uplands. The valley bottom would naturally be covered by dense poplar (*Populus euphratica*) forest (see 1.1.). Most of the plant taxa established for Mureybit could have formed part of steppe vegetations and it seems justified to assume that in early Holocene times, during the habitation of the site, the uplands were covered by steppe. Steppe vegetations include various species of the chenopod family. Three genera of this family are represented at Mureybit, but a very common chenopodiaceous steppe plant, *Noaea mucronata*, is conspicuously absent at Mureybit and Abu Hureyra. One could speculate that the seeds of *Noaea* have little chance of surviving carbonization. This could also explain the absence of wormwood (*Artemisia*) in the seed record. The small and fragile fruits of this very common steppe plant easily get destroyed in a fire.

A great number of *Astragalus* species is reported for steppe vegetations and the relatively high proportions of this seed type indicate that milkweed species were found in the vicinity of the site. The absence of *Onobrychis* at Mureybit and its frequent occurrence in the Abu Hureyra samples could point to differences in the composition of the vegetation in both areas. Another striking difference in the seed record of both sites is provided by the grasses. Grass species may play a prominent role in steppe vegetations, but as a result of over-grazing they have largely been replaced by unpalatable and toxic species. Grasses are only moderately represented at Mureybit, this apart from wild einkorn wheat and barley in phase III levels. Curiously, the very characteristic steppe grass genus *Stipa* is abundant at Abu Hureyra, but altogether absent at Mureybit. Even assuming that the Abu Hureyra inhabitants gathered *Stipa* and those from Mureybit did not, it remains strange that not a single *Stipa* fruit would have been found if the species was common in the vicinity of the site. This rather points to another difference in the local vegetation. *Stipa* is very sensitive to over-grazing (*cf.* Hillman, 1975), but it is difficult to imagine that this could explain its absence or scarcity in the vicinity of Mureybit.

Another striking difference between the seed records of both sites concerns *Celtis* (hackberry), which is well represented at Abu Hureyra, but conspicuously absent at Mureybit. A complicating factor here is the fact that we do not know whether at the time *Celtis*, and the same applies to *Pistacia*, were found in the north Syrian plain or whether the fruits concerned could have been collected only at a fair distance from the site. In the latter case the difference would rather point to different regions exploited by the inhabitants of both sites for wild food resources.

The abundance of the small *Polygonum* (knotweed) nutlets in both sites is somewhat puzzling. As has been mentioned (3.21.) the species determination is still problematical, but all the species of the *aviculare* section, to which the seeds concerned belong, thrive particularly well in disturbed habitats, such as waste places, fields and roadsides. It is not likely that at the time these terrains were widespread, but, on the other hand, the river valley may have offered natural, nitrate-rich habitats (see below). Be this as it may, *Polygonum* is represented in the charred seed record in great abundance, quite out of proportion to the role of this species in the vegetation. The latter applies with certainty also to *Arnebia decumbens* and *Lithospermum tenuiflorum.* The chances for these and other boraginaceous seed types to survive in dry sediments are much better than those for the seeds and fruits of most other plant taxa. Because of the silica skeleton also non-carbonized boraginaceous fruits remain preserved. A complicating factor may be contamination with modern or near-modern seeds due to the activity of burrowing and seed collecting animals. The high frequencies of boraginaceous seed types in archaeological deposits are still puzzling. Umbelliferae, *Plantago*, *Helianthemum*, *Phlomis*, *Salvia*, *Teucrium* and other common steppe-plant taxa are not represented in the seed record.

In addition to poplar, tamarisk (*Tamarix*), ash

(*Fraxinus*) and perhaps other arboreal species, not attested for Mureybit, formed part of the river-valley forest. It is likely that tamarisk shrubs were particularly found along the forest borders. Not only arboreal species but also various weeds attested for Mureybit must have come from the valley floor. Thus, sea club-rush (*Scirpus maritimus*), carbonized achenes of which are quite frequent at Mureybit, and reed (*Phragmites australis*), stem fragments of which are reported for Abu Hureyra, must have grown in the Euphrates valley.

It has been hinted at above that in the river valley, nitrate-rich open habitats may have been present. In river valleys, much organic debris is left when after high floods the water recedes again. Open places could have been created by natural agencies, such as damage inflicted upon the vegetation by the action of water during high floods and the dying off of trees because of old age. On these open places, where in addition to a high nitrate content, the light conditions were favourable, various 'weedy' species, such as *Polygonum*, *Echinochloa*, *Setaria/Digitaria* and *Chenopodium album*, may have grown profusely.

4.7. Potential field weeds

Above (4.3.) the hypothesis of cultivation of wheat and barley, or at least of some sort of manipulation favouring the growth of these cereals, has been discussed. Possible proto-agricultural or agricultural practices could have resulted in the expansion of plant species that we now designate as (field) weeds. Weeds evolved from those species of the natural vegetation that had the ability to adapt themselves to man-induced environmental conditions. Various steppe-plant species developed into widespread weeds, but a great number of weeds conveniently regarded as of Near Eastern origin are not known from natural vegetations (Zohary, 1973: p. 648). However this may be, higher frequencies of potential weed species in phase III levels would support the hypothesis of (proto)agriculture at Mureybit. For, if cultivation was practised, the high wild wheat and barley frequencies in phase III levels should imply that the acreage of fields had increased quite considerably or that fields had been laid out for the first time. With the expansion of cultivated or semi-cultivated land the proportion of field weeds in the local flora must have increased in no small measure. However, the mean values of various potential weeds, such as *Androsace maxima*, *Atriplex*, *Chenopodium album*, *Eremopyrum* and *Fumaria* are not higher in phase III than in phases I and II. Only *Silene/Gypsophila* shows its highest percentage in phase III. The high mean *Galium* percentage in phase III is occasioned by the great number of cleaver fruits in only one sample: Mb 1967, I 130 cm. In conclusion, the weed-seed frequencies lend no support to the hypothesis of (proto)agricultural practices.

4.8. The exploitation of the plant resources

There can be no doubt that the morphologically wild einkorn wheat and barley served as human food irrespective of the question whether these cereals were collected in the wild or cultivated. It is very likely that lentil and pea were also consumed by the inhabitants of the site. If cereals were cultivated, these pulse crops could likewise have been grown. As for the other potential food plants, only speculations on their possible role in the diet of the Mureybit people can be made.

The rather great numbers of *Astragalus* seeds could indicate that they were gathered for human consumption. An alternative explanation is that the plants were collected as fuel and that in this way appreciable numbers of seeds arrived in the settlement and subsequently became carbonized. However, one wonders whether *Astragalus* plants served as fuel because plenty of wood was available in the valley bottom. This increases the likelihood that the milkweed seeds were gathered as food. The fruits of the wild grasses *Echinochloa* and *Setaria/Digitaria* may have been collected for human consumption and the same applies to the *Atriplex*-type and *Chenopodium* seeds. The usually high frequencies of *Polygonum* nutlets suggest that they were collected on purpose, probably as food. It is difficult to imagine how otherwise such great numbers of this fruit type could have arrived in the settlement. Somewhat enigmatic are the great numbers of *Asparagus* seeds in phase I levels. If this plant already played a role in the diet of the inhabitants, it was certainly not the berries but the sprouts or the rhizomes that were eaten. It goes without saying that important food plants may not be represented at all in the seed record because the edible roots, bulbs or leaves of these plants were collected before seeds had developed.

Wild fruit trees and shrubs that were exploited by the inhabitants of the site include *Pistacia* (pistachio), *Ficus* (fig) and *Capparis* (caper). *Ficus* seems to have been of minor importance as otherwise more fig pips should have been recovered (only 3 pips and one basal part of a fig). *Pistacia* (*atlantica*) may have been collected at quite some distance from the site. At present, this tree is not found in the Mureybit area. Contrary to Abu Hureyra, *Celtis* (hackberry) is not represented at Mureybit.

The river-valley forest must have been of great economic importance because it provided the inhabitants of a steppe environment with an easily accessible and almost inexhaustible supply of timber and firewood. Thus, charred remains of wall posts of phase III houses have been identified as poplar (Cauvin, 1977: p. 28). The significance of the valley-bottom forest as the habitat of Persian fallow deer (*Dama mesopotamica*) and wild boar (*Sus scrofa*) is evident. Both game animals are represented among the faunal remains (1.5.).

It has already been pointed out that the interpretation of the Mureybit vegetable remains in terms of the vegetation in the vicinity of the site, the exploitation of the plant resources, plant processing activities and so on must remain unsatisfactory. It is conceivable that in the future the results obtained for other archaeological sites may give occasion to a re-evaluation of the Mureybit data.

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