ARCHAEOBOTANICAL STUDIES IN THE LEVANT
2. NEOLITHIC AND HALAF LEVELS AT RAS SHAMRA

W. van Zeist and J.A.H. Bakker-Heeres

ABSTRACT: This paper deals with the examination of charred seeds and fruits recovered from aceramic and ceramic Neolithic (6500-5250 B.C.) and Halaf levels (5250-4300 B.C.) unearthed in sounding SH at Ras Shamra, Northwest Syria. Emmer wheat (*Triticum dicoccum*) and two-rowed hulled barley (*Hordeum distichum*) were the major cereal crop plants, whereas einkorn wheat (*Triticum monococcum*) and free-threshing wheat (*Triticum durum/aestivum*) were of minor importance. The pulse crops included lentil (*Lens culinaris*) and field pea (*Pisum sativum*). Linseed (*Linum usitatissimum*) was also cultivated. It looks as if the importance of pulses relative to cereals diminished considerably in the course of the prehistoric habitation. The crop-plant assortment of the phase Va (5750-5250 B.C.) farmers at Ras Shamra is compared to that of sixth millennium B.C. sites in Cyprus and inland SW Asia. In addition to wild olive, the fruits of pistachio, grape, fig and hawthorn were collected. Among the weeds, *Lolium* shows high proportions in Halaf levels. A comparison is made of the weed seed types demonstrated for Ras Shamra, Ramad and Erbaba (Turkey).

KEYWORDS: Ras Shamra, Neolithic, Halaf, crop plants, wild fruits, weeds.

1. THE SITE AND ITS ENVIRONMENT

1.1. The site

The tell site of Ras Shamra (Ugarit) is located in Northwest Syria, c. 10 km north of Lattakia, about 1500 m from the present-day coast-line (fig. 1). The tell, measuring about 600 m north-south and 850 m east-west, covers an area of a good 30 ha and rises up to 18 m above the surrounding plain. To the north and the south the site is bordered by branches of the Nahr el Fidd which rivulet debouches in the bay of Minet el Beida (fig. 2).

Excavations by the French Archaeological Mission under the direction of Professor Cl.A.-F. Schaeffer have uncovered the ruins of the second millennium B.C. city of Ugarit. The remains include two palaces, temples dedicated to Baal and Dagon, libraries and residential areas. The palaces and the libraries yielded numerous clay tablets with Sumerian, Babylonian, Hurrian and Ugaritic texts which are of great linguistic, political and religious significance. The kingdom of Ugarit was of only small territorial extent, but the city owed its prosperity to trade relations with all parts of the then known world. The rise of Ugarit took place in the early second millennium B.C., and around 1200 B.C. the city was destroyed by the so-called Sea Peoples, to recover no more from this blow.

The city of Ugarit was founded on the occupational debris of previous habitation. More than 18 metres of Early Bronze Age, Chalcolithic and Neolithic deposits, covering a time span from c. 6500 to 2000 B.C., have been established. In 1934-1960 the prehistoric deposits have been tested in nine soundings carried out by Cl.A.-F. Schaeffer and collaborators (Schaeffer, 1962). In 1962-1976 H. de Contenson examined the prehistoric levels in sounding SH. The samples that have been examined for plant remains originate from de Contenson's sounding.

1.2. The SH sounding

The SH sounding was laid out to the southwest of the temple of Baal, directly north of the SC sounding (1953-1960). Part of the south delimitation of the SH sounding was formed by the exposed north section of the SC sounding (fig. 4a). The approximate location of the SH sounding is indicated in figure 3. At the top of the tell the SH sounding had a surface area of about 150 m^2. To evacuate the excavated soil every two metres a platform of 1 m wide was left standing, thus gradually reducing the surface excavated. The levels excavated date from the Early Bronze Age to the Neolithic (de Contenson, 1970; 1973; 1977).

As samples for botanical examination were taken only from Halaf and Neolithic levels, a brief discussion of the archaeological remains will be confined to these levels. For further details the reader is referred to the reports of de Contenson (1973; 1977).

Phase Vc, 13.20-14.30/14.80 m, c. 6500-6000 B.C. The thickness of the phase Vc deposits depends on

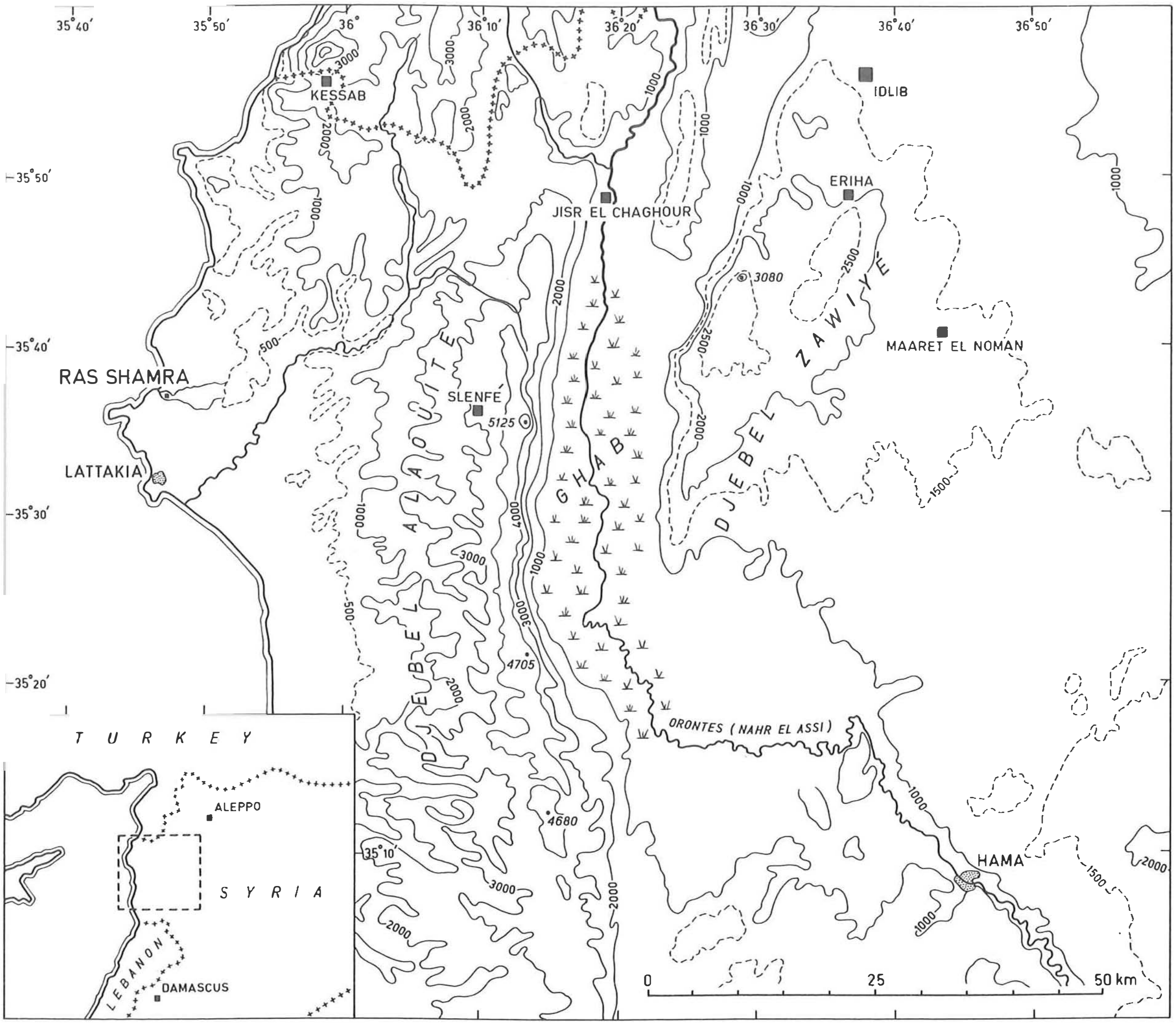

Fig. 1. Map of northwestern Syria with the location of Ras Shamra. Elevation contour lines are given in feet.

the slope of the bedrock. In the lower half of the deposits no traces of architecture were found, but in the upper layers rectangular structures of stone walls came to light. No pottery was recovered from this phase. Flint artifacts, on the other hand, occur in great quantities. Three radiocarbon measurements date phase Vc to the second half of the 7th millennium B.C. The aceramic Neolithic at Ras Shamra corresponds to the Pre-Pottery Neolithic B in the Syro-Palestinian area.

Phase Vb, 12.30-13.20 m, c. 6000-5750 B.C. The remains of architecture consist of rectilinear stone walls, up to 60 cm high. Flint artifacts are much less abundant than in phase Vc, but, on the other hand, pottery, mainly burnished ware, is present. The end of phase Vb is radiocarbon dated to c. 5750 B.C.

Phase Va, 10.20-12.20 m, c. 5750-5250 B.C. The small, rectangular houses had plastered floors. The house walls were built of stones. The proportion of burnished ware decreases considerably and matte pottery becomes dominant. There is more decorated pottery than in the preceding phase. Moreover, white vessels in moulded plaster (*vaisselle blanche*) are present in this phase. A radiocarbon assay suggests a date of c. 5250 B.C. for the end of phase Va.

Phase IV, 6.25-10.20 m, c. 5250-4300 B.C. This phase is characterized by Halafian style pottery

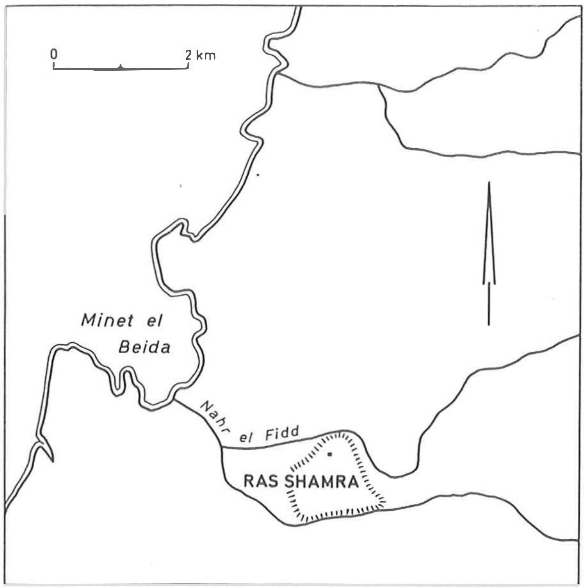

Fig. 2. Map of the Ras Shamra area. After Schaeffer (1939: fig. 1).

and corresponds to the Halaf culture of northeast Syria, southeast Turkey and north Iraq. The houses are rectangular in groundplan, with mudbrick walls on stone foundations. A characteristic feature are the circular ovens. The date of c. 4300 B.C. for the end of the Halaf phase at Ras Shamra is based upon the radiocarbon date of 4148 ± 173 B.C. for phase IIIc.

1.3. The environment

Ras Shamra lies in a fertile coastal plain which to the east is bordered by hilly country. The soils of the plain consist of red sandy loam, black colluvium and gray and white colluvium (van Liere, 1960-1961: fig. 12).

For Lattakia an average annual precipitation of 788 mm is recorded, while mean January (coolest month) and August (warmest month) temperatures are 12.7° and 27.2 °C, respectively (Zohary, 1973: table 4). The summer is a dry period, almost without rain.

Of the natural vegetation of the Ras Shamra area virtually nothing remains. The fertile coastal plain has been under cultivation from time immemorial. This does not prevent us from presenting a tentative description of the vegetation which once must have covered the area. Information on the vegetation has been taken from Nahal (1962) and Zohary (1973).

Ras Shamra lies in the zone of the Ceratonio-Pistacion lenticus, which syntaxonomic unit comprises the vegetation of the lowermost Mediterranean vegetation belt, at elevations between sea-level and about 300 m. Of the trees and shrubs of this vegetation zone are mentioned here: *Pistacia lentiscus*, *Olea europaea* var. *oleaster* (wild olive), *Quercus calliprinos* (evergreen oak), *Myrtus communis*, *Pistacia palaestina*, *Arbutus andrachne*, *Ceratonia siliqua* (carob tree), *Calycotome villosa*, *Spartium junceum*, *Sarcopoterium spinosum* (which becomes a dominant species in severely degraded vegetations) and *Erica verticillata*. Besides, in northwestern Syria, *Pinus brutia* is a constituent of this vegetation zone. The pollen content of the basal layers at Ras Shamra suggests an appreciable proportion of pine in the vegetation in the vicinity of the site (*cf.* de Contenson, 1977: p. 21).

In the Baer-Bassit mountains to the north of the Ras Shamra area and in the Djebel Alaouite to the east (fig. 1), at elevations between c. 300 and 800 m, Quercion calliprini vegetations constitute the natural plant cover. Of the arboreal species of this vegetation belt are mentioned here: *Pistacia palaestina*, *Quercus calliprinos*, *Quercus infectoria* (deciduous oak), *Phillyrea media*, *Ostrya carpinifolia*, *Crataegus aronia*, *Acer syriacum*, *Pyrus syriaca*, *Styrax officinalis*, *Juniperus oxycedrus* and *Pinus brutia*. *Pinus brutia* is a highly invasive species which replaces the local forest vegetation after it has been destroyed by cutting. The secondary *Pinus brutia*

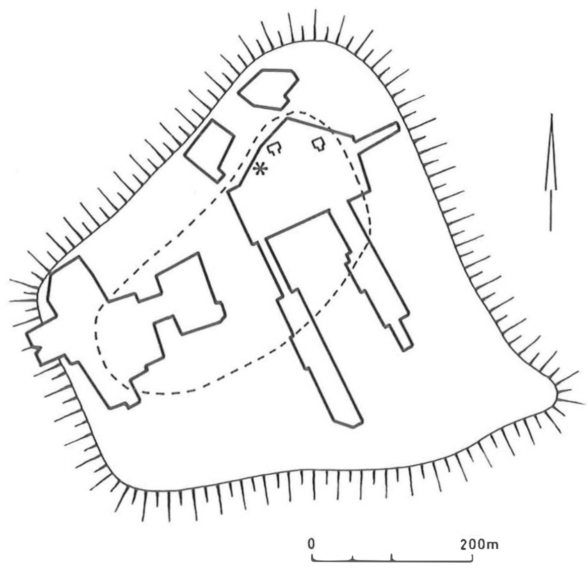

Fig. 3. Outline plan of Ras Shamra on which the areas excavated by Schaeffer are indicated. After a plan in a tourist folder prepared by Gabriel Saade (published in 1967). The location of the SH sounding, c. 25 m southwest of the temple of Baal, is indicated with an asterisk. The dashed line indicates the approximate extent of the Neolithic habitation. The Chalcolithic and Early Bronze settlements were reduced to the eastern part of this area (pers. comm. by H. de Contenson).

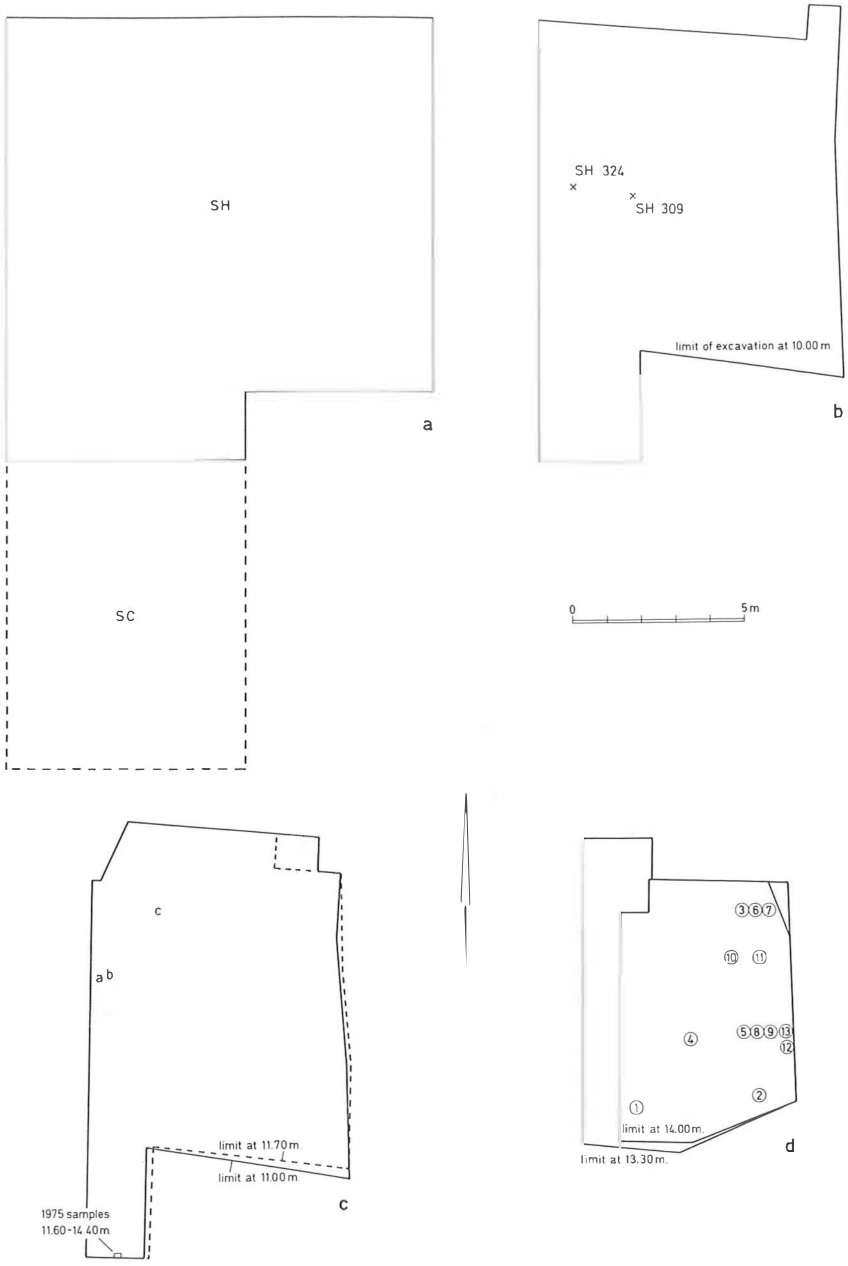

Fig. 4. Limits of the area excavated (sounding SH) at various depths.
a. Approximate outline of soundings SH and SC at the surface of the tell.
b. The limits of excavation 10.00 m below the surface. Two of the samples from the 10.00 m level are from near find SH 309.
c. The stippled areas are Halaf intrusions in Va levels. a (11.00: 030/460), b (11.00: 050/450) and c (10.75-11.00, SH 359) are the locations of the 1973 samples shown in table 1. Sample c is from a pit with an infant burial in a jar.
d. On this plan the horizontal location of samples (1, 2, 3, *etc.*) taken from levels between 13.30 and 14.60 m is indicated (see table 4).

forest harbours a rich shrubby undergrowth (Zohary, 1973: p. 343).

Azonal vegetation occurs along streams. At present, *Nerium oleander* often determines the aspect of stream valley vegetations because it regenerates easily and it is not eaten by animals (the leaves contain a poisonous milky juice). Originally a more varied tree and shrub vegetation, including *Salix*, *Tamarix*, *Ficus*, *Rubus*, *Vitis*, *Fraxinus*(?) and *Ulmus*(?), may have been found here.

2. THE SAMPLES

As has been mentioned above, with increasing depth below the surface of the tell the area excavated was reduced in size. Figures 4b-d show the outline of the SH sounding at the deeper levels from which by far the majority of the samples originate.

Most of the Halaf samples examined for plant remains were secured in 1972. Samples which were poor in charred seeds and fruits have been dis-

Table 1. Seeds and fruits from Halaf levels.

Phase		IVb							IVc			
Sample designation	RS'72 7.00 west	7.80 north	8.00 east	8.75 west	10.00 fire place SH324	10.00 NE area	10.00 E area	10.00 SH309 (1)	10.00 SH309 (2)	RS'73 10.75 –11.00 SH359	11.00 050/ 450	11.00 030/ 460
Triticum durum/aestivum	–	–	–	1	1	–	–	–	–	–	6	–
Triticum monococcum	2	–	–	–	1	–	–	–	2	–	1	–
Triticum dicoccum	60	10	15	13	15	7	10	200	100	6	106	57
Triticum spikelet forks	258	21	102	86	100	22	20	16	86	195	1217	137
Triticum glume bases	570	61	163	147	178	5	85	35	152	164	2366	352
Hordeum distichum/spec.	23	15	30	8	11	–	–	4	–	–	22	21
Hordeum internodes	–	2	5	10	1	–	–	2	–	1	126	13
Cereal grain fragments	245	–	41	24	43	–	–	–	403	32	178	349
Lens	5	–	2½	1	1	–	2	–	1	10	2	8
Pisum	–	–	–	1	–	–	–	–	–	–	–	1
Linum usitatissimum	1	–	–	–	–	–	1	–	–	–	1	–
Aegilops	–	–	–	–	–	–	–	–	1	–	–	–
Amygdalus	–	–	–	–	–	–	–	–	–	+	–	–
Asphodelus	–	–	–	–	–	–	–	–	–	–	–	2
Avena	–	–	–	1	–	–	–	–	–	–	1½	½
Bellevalia	–	1	3	–	–	–	–	–	–	–	–	1
Bromus spec.	1½	1½	1	–	½	–	–	–	–	–	–	–
Carex cf. divisa	–	–	–	–	1	–	–	–	–	–	–	–
Crataegus	–	–	–	–	–	–	–	–	–	–	½	5
Echium	–	–	–	–	–	–	–	–	–	–	2	2
Ficus	2	–	3	2	2	–	1	–	1	8	25	40
Galium	–	–	–	–	–	–	–	–	–	–	3	–
Gramineae indet.	–	–	–	–	1	–	–	–	–	–	2½	–
Leguminosae indet.	–	–	–	–	–	–	–	–	–	1	–	–
Lithospermum arvense	–	–	–	3	–	–	–	–	–	–	–	2
Lolium spec.	156	62	150	200	360	8	20	175	100	–	670	173
Lolium temulentum-type	–	–	3	–	–	–	–	–	–	1	12	13
Lolium (fragments)	218	–	–	–	–	–	–	–	92	–	103	275
Malva	2	–	3	–	1	–	2	1	1	–	2	–
Medicago	–	1	–	–	–	1	–	1	–	–	–	–
cf. Ochthodium	–	–	5	–	–	–	–	–	2	–	–	–
Olea	–	–	–	–	1	+	¾	–	–	–	+	+
cf. Ornithogalum	4	5	10	13	2	–	–	2	1	½	15	14
Phalaris	3	–	–	2	1	–	–	1	2	7	22	2
Pistacia	–	–	–	–	–	–	–	–	–	1	–	–
Rumex spec.	–	–	–	–	–	–	–	–	–	–	–	1
Rumex pulcher	1½	–	4	–	–	–	–	1	1	–	4	1
Scirpus maritimus	–	–	1	–	–	–	–	–	–	1	–	–
Scorpiurus	8	–	1	–	–	4	–	1	–	–	8	4
Sherardia arvensis	–	–	2	–	–	–	–	–	–	1	–	–
Thymelaea	2	1	1	–	–	–	–	–	1	–	–	–
Trifolium-type	25	–	7	–	–	–	–	–	–	–	–	–
Vicia	2	–	–	2	1	–	–	1	1	1	–	–
Vitis vinifera	–	–	–	–	–	–	–	–	–	–	1	1
Unidentified	–	–	1	1	5	1	–	3	3	–	4	–

caraed. Four of the samples presented in table 1 (7.00-8.75 m) are from exposed balks. The levels from which these samples originate had been excavated in previous years. The indications west *etc.* refer to the balk concerned. The other 1972 samples were taken from the surface exposed at a depth of 10.00 m (fig. 4b). In addition, three Halaf samples were taken in 1973 (see below).

In 1973, soil samples were collected from surfaces exposed at depths from 11.00 to 11.65 m. As for the sample designations (table 2), the first number indicates the depth, the second number the distance in cm from the west balk and the third number the distance from the north balk. Thus, the first sample of table 2 is from a depth of 11.00 m, at 4.00 m from the west balk and 1.00 m from the north balk. Almost all 1973 samples are from deposits attributed to phase Va. Three samples

Table 2. Seeds and fruits from phase Va levels (fr. = fruit)

Sample designation RS '73	11.00:400/100	11.00:460/250	11.00:330/550	11.00:450/650	11.10:140/250	11.10:350/260	11.10:300/660	11.10:030/890	11.10:030/900	11.10:150/1080	11.20:300/140	11.20:650/610	11.30:280/210	11.30:050/300	11.30:180/330	11.30:670/520	11.30:050/600	11.30:170/670	11.40:650/150	11.60:350/050
Triticum durum/aestivum	-	-	-	-	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-
Triticum monococcum	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Triticum dicoccum	5	11	3	21	23	17	5	5	4	3	38	15	22	-	38	1	9	-	7	24
Triticum spikelet forks	27	103	89	1078	87	50	84	50	19	58	33	657	13	-	993	5	187	-	51	69
Triticum glume bases	16	49	198	1365	69	17	95	49	18	29	4	460	13	-	494	-	168	-	37	25
Hordeum distichum/spec.	8	6	1	7	6	3	-	1	1	3	24	3	6	-	5	-	2	-	2	4
Hordeum internodes	-	-	3	1	-	-	-	-	-	-	-	4	-	-	-	-	2	-	1	-
Cereal grain fragments	30	35	11	151	45	73	53	16	8	10	157	32	88	-	123	3	27	-	76	108
Lens	3	16	2½	21	16	9½	8	6	1½	6½	33	4	14	-	18	½	3	-	12	32
Pisum	1	4	-	2	-	-	+	-	-	-	½	1½	-	-	-	-	1	-	-	-
Lathyrus sativus/cicera	-	1	-	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-
Linum usitatissimum	-	1	-	-	-	2	-	-	-	-	2	-	-	-	1	-	-	-	1	½
Ammi majus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
Amygdalus	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Asphodelus	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
Avena	-	-	-	-	½	-	-	½	-	-	3	-	-	-	½	-	-	-	2	½
Bellevalia	2	-	1	-	1	2	1	2	1	1	1	½	-	-	½	-	-	-	-	1
Bromus	-	½	-	½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bupleurum subovatum-type	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Carex cf. divisa	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Cornus mas	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Coronilla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crataegus	-	-	-	-	-	-	-	-	-	-	½	-	-	-	-	-	-	-	-	-
Crucianella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Echium	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Ficus	-	-	1	-	2	3	1	-	-	-	-	8	-	-	2	-	1	1fr.	-	1
Galium	1	-	1	1	-	-	-	-	1	1	1	-	-	-	1	-	-	-	-	1
Gramineae indet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leguminosae indet.	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Lithospermum arvense	3	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	1	-	6	3
Lolium spec.	½	2	1	6	5	9	4	2	2	2½	28	2	7	-	23	½	16	-	3	20
Lolium temulentum-type	-	1	-	2	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Malva	-	-	-	1	2	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Medicago	-	-	-	-	-	-	-	-	-	1	1	-	-	-	5	-	-	-	6	1
Melilotus	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-
Olea	-	-	-	+	-	-	-	+	-	-	+	-	-	-	-	½	-	-	-	+
cf. Ornithogalum	-	-	1	-	2	4	13	-	-	1	4	-	2	-	½	-	1	-	1	5
Phalaris	1	5	1	61	5	6	4	-	-	3	15	1	20	-	44	-	3	-	24	27
Plantago squarrosa-type	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pistacia	-	+	-	-	+	+	-	+	-	+	-	1	-	-	-	-	+	-	1	-
Rumex spec.	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
Rumex pulcher	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4
Scirpus maritimus	1	-	2	11	3	-	-	4	-	-	14	5	-	-	2	-	3	-	-	5
Scorpiurus	1	2	-	1	5	1	-	-	-	-	-	1	3	-	2	-	1	-	-	3
Sherardia arvensis	1	-	-	4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1
Thymelaea	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-
Trifolium-type	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vicia	-	-	-	1	-	-	-	-	1	-	-	-	2	-	-	-	-	-	1	1
Ziziphora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified	+	-	+	2+	-	-	+	+	2	3	+	+	-	-	2+	-	-	-	4	-

	11.60:300/450	11.60:150/600	11.60:730/700	11.65:100/260	11.65:100/600	11.65:060/1100	RS'73 Sample designation
	-	-	-	-	-	-	Triticum durum/aestivum
	-	-	-	-	-	-	Triticum monococcum
	-	-	11	1	1	1	Triticum dicoccum
	14	9	7	6	2	46	Triticum spikelet forks
	9	2	4	6	1	15	Triticum glume bases
	2	-	10	-	-	-	Hordeum distichum/spec.
	-	-	-	-	-	-	Hordeum internodes
	24	12	70	7	8	5	Cereal grain fragments
½	7	10	3½	½	4	2	Lens
	-	+	-	·	-	½	Pisum
	-	-	-	-	-	-	Lathyrus sativus/cicera
	1	1	-	-	1	-	Linum usitatissimum
	-	-	-	-	-	-	Ammi majus
	+	-	-	-	-	-	Amygdalus
	-	-	-	-	-	-	Asphodelus
½	-	-	1	-	-	-	Avena
	-	-	2	-	1	-	Bellevalia
½	-	-	-	-	-	-	Bromus
	-	-	-	-	-	-	Bupleurum subovatum-type
	-	-	1	-	-	-	Carex cf. divisa
	-	-	-	-	-	-	Cornus mas
	-	-	-	1	-	1	Coronilla
	-	-	-	-	-	-	Crataegus
	-	1	-	-	-	-	Crucianella
	-	-	-	-	-	-	Echium
	1	-	1	-	-	1	Ficus
	-	-	1	-	1	-	Galium
	-	-	6½	-	-	-	Gramineae indet.
	-	-	-	-	-	-	Leguminosae indet.
	-	1	1	-	-	-	Lithospermum arvense
	1	-	6	-	-	-	Lolium spec.
	-	-	1	-	-	-	Lolium temulentum-type
	-	1	3	-	-	-	Malva
	-	-	-	-	-	-	Medicago
	-	-	-	-	-	-	Melilotus
	+	-	+	-	+	-	Olea
	-	-	1	-	-	1	cf. Ornithogalum
	-	1	15	2	1	-	Phalaris
	-	-	-	-	-	-	Plantago squarrosa-type
	-	-	-	-	-	-	Pistacia
	-	-	-	-	-	-	Rumex spec.
	-	-	-	-	-	-	Rumex pulcher
	1	1	2	1	1	-	Scirpus maritimus
	-	-	1	-	-	-	Scorpiurus
	-	-	-	-	-	1	Sherardia arvensis
	-	-	-	-	-	2	Thymelaea
	-	-	-	-	-	-	Trifolium-type
	-	-	-	-	-	-	Vicia
	-	-	-	-	-	-	Ziziphora
	-	-	2	-	-	-	Unidentified

(shown in table 1) are from Halaf intrusions in the phase Va deposits (a pit and one infant burial in a jar).

In 1975, the excavation had not yet started when the first author was at the site for securing samples. For that reason a series of samples was taken from the exposed north section of the SC sounding which bounded the SH operation to the south (see fig. 4c). The samples were secured at intervals of 10 and 20 cm and belong to phases Va, Vb and Vc (see table 3).

Finally, in 1976 samples could be collected from surfaces exposed at depths from 13.30 to 14.60 m (table 4). The horizontal locations of these samples are indicated in figure 4d. The depths at which the samples were taken are given in table 4.

The volume of the soil samples was usually one or two baskets of about 12 litres each, sometimes less (see 4.2.). The samples were processed in the field by means of manual water flotation. The palaeobotanical field work was carried out by Mrs. Yvonne M. Koster (in 1976) and by the first author.

3. THE PLANT REMAINS

For descriptions of most of the seed and fruit types established for Ras Shamra the reader is referred to sections 4 and 5 of the publication on the palaeobotany of the Neolithic sites in the Damascus basin (van Zeist & Bakker-Heeres, 1982(1985)). It was considered unnecessary to repeat here the descriptions and to present new illustrations of plant remains already discussed in the latter publication. Only of the seed and fruit types not demonstrated for the Damascus basin sites are descriptions provided in this section. Other plant remains are only treated in this section insofar as they give occasion to comments with respect to identification, size, comparison with other sites, *etc.* All measurements (tables 5-9) are in mm.

3.1. Cultivated plants

Wheat. Among the wheats, *Triticum dicoccum* (emmer wheat) is by far the most important species. Einkorn wheat (*Triticum monococcum*) and free-threshing wheat (*Triticum aestivum/durum*) are only scarcely represented. Whether or not the latter species were grown as crops in their own right must be left undecided. Moreover, the distinction between emmer wheat and bread wheat/hard

Table 3. Seeds and fruits from phase V levels. The samples were taken from the exposed south section (see fig.4c). Numbers between brackets: very likely of much younger date.

Phase	Va						Vb					Vc											
Sample designation RS'75	11.60	11.80	12.00	12.20	12.40	12.60	12.80	12.90	13.00	13.10	13.20	13.30	13.40	13.50	13.60	13.70	13.80	13.90	14.00	14.10	14.20	14.30	14.40
Triticum dicoccum	3½	1	-	5	-	4	1	3	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-
Triticum spikelet forks	194	86	142	338	162	620	81	15	13	4	3	2	2	-	-	1	1	-	-	-	2	3	-
Triticum glume bases	220	78	133	252	167	306	40	9	1	2	5	4	2	-	-	-	-	-	-	-	-	-	-
Hordeum distichum/spec.	-	-	-	-	2	4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hordeum internodes	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal grain fragments	28	8	14	24	19	92	27	23	14	7	11	3	8	2	2	1	-	1	½	2	-	-	½
Lens	6	1½	5	4½	2	15	13	10	7	7	8½	10	3½	1	1½	1	-	1½	-	½	1	4	1
Pisum	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-
Linum (usitatissimum)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	½	-	-	-
Adonis	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Ammi majus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amygdalus	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avena	-	-	-	-	-	½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bellevalia	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Bromus	-	-	-	½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Capparis	-	-	-	-	-	-	-	-	-	-	(14)	(72)	-	-	-	-	-	-	-	-	(1)	-	-
Crataegus	-	-	-	-	½	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eleocharis	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ficus	8	8	5	11	10	24	5	2	1	-	-	-	-	2	-	1	-	-	-	-	-	1	-
Gramineae indet.	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithospermum arvense	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithospermum tenuiflorum	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lolium spec.	2	-	2	1	2	3	-	2	1	½	1	2	-	-	-	-	-	-	-	-	-	-	-
Lolium temulentum-type	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malva	-	1	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Melilotus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Olea	+	+	-	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	-	-	-	+	-
cf. Ornithogalum	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Phalaris	8	-	5	15	5	20	4	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-
Pistacia	-	+	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rumex pulcher	-	-	-	1	2	2½	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scirpus maritimus	3	2	-	3	3	21	5	2	2	1	3	-	-	-	-	-	-	-	-	-	-	-	-
Scorpiurus	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sherardia arvensis	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Thymelaea	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Valerianella dentata-type	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vicia	-	-	-	-	-	-	-	-	-	-	-	-	-	½	-	-	-	-	-	-	-	1	-
Vitis vinifera	-	-	-	-	-	-	-	-	-	-	-	(1)½	1	-	-	-	-	-	-	-	-	-	-
Unidentified	1	-	-	4	1	4	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-

wheat was sometimes rather arbitrary because of poor preservation. The dimensions and index values of *T. dicoccum* grains from Halaf samples are presented in table 5. The Ras Shamra emmer wheat grains are, on average, somewhat larger than those from Ramad, which could be due to the more favourable climatic conditions (higher precipitation) in the northwest Syrian coastal area.

In addition to the grains, great numbers of spikelet forks and glume bases of hulled wheat were found. For five samples the width of 100 spikelet forks has been determined (table 6). The somewhat greater mean sizes of the Ras Shamra emmer wheat grains, compared to those at Ramad, does not find expression in the width of the spikelet forks. The average width of the spikelet forks in the Ras Shamra samples (1.71-1.92 mm) fluctuates within the range of the mean values of the Ramad specimens (1.68-1.95 mm; van Zeist & Bakker-Heeres, 1982(1985): table 14). The frequency distribution graphs for the width of the spikelet forks in both sites do not suggest significant differences, either (fig. 5 and van Zeist & Bakker-Heeres, 1982(1985): fig. 13). Inspection of the randomly measured spikelet forks from Ras Shamra showed that the specimens with a width of 1.2-1.3 mm are of terminal spikelets.

Table 4. Seeds and fruits from phase Vc levels. The sample numbers (1, 2, 3, etc.) refer to figure 4d.

Sample number		1	2	3	4	5	6	7	8	9	10	11	12	13
Sample designation	RS'76	13.40	13.50	13.60	13.70	13.80	13.90	14.00	14.10	14.20	14.30	14.40	14.50	14.60
Triticum dicoccum		-	-	-	-	-	-	2	2	1	-	-	-	-
Triticum spikelet forks		1	-	-	-	-	-	1	-	1	-	-	1	-
Triticum glume bases		-	-	1	-	1	1	-	-	-	-	-	-	-
Hordeum distichum/spec.		-	-	-	-	1	-	1	-	-	-	-	-	-
Cereal grain fragments		11	2	1	1	9	1	2	5	-	1	1	1	-
Lens		6	3½	-	3½	28	8	6	13	5	1	14½	2½	2
Pisum		1½	-	-	-	1	-	-	-	-	+	1	-	-
Linum (usitatissimum)		-	-	1	-	-	-	-	-	-	-	-	-	-
Avena		-	-	½	-	-	-	-	-	-	-	-	-	1
Crataegus		-	-	-	-	-	½	-	-	-	-	-	-	-
Ficus		-	-	1	1	2	-	2	1	-	-	12	-	-
Galium		-	-	-	-	1	-	-	-	-	-	-	-	-
Leguminosae indet.		-	-	-	-	-	1	-	-	-	-	-	-	-
Lolium spec.		-	-	-	-	1	-	-	1½	-	-	1	-	-
Medicago		-	-	-	-	-	1	-	-	-	-	1	-	-
Olea		-	+	-	-	-	+	-	-	-	-	+	-	-
Phalaris		-	-	-	-	-	-	-	-	-	-	1	-	-
Rumex pulcher		-	-	-	-	-	-	-	-	-	-	2	-	-
Vicia		-	-	-	-	-	-	-	-	-	1	-	-	-
Vitis vinifera		-	-	-	-	-	-	-	-	-	-	2	-	-
Unidentified		-	-	-	-	4	1	-	-	2	-	+	-	-

Table 5. Dimensions and index values of *Triticum dicoccum* grains.

		L	B	T	L/B	T/B
RS'72 10.00 m	Min.	5.1	2.2	1.7	180	78
near SH 309 (1)	Aver.	5.72	2.70	2.50	213	92
N = 24	Max.	6.4	3.3	3.0	245	109
RS'72 10.00 m	Min.	4.8	2.2	2.2	182	74
near SH 309 (2)	Aver.	5.79	2.76	2.56	211	94
N = 18	Max.	7.0	3.2	3.2	278	110
RS'73 11.00 m	Min.	5.0	2.2	2.1	192	79
0.50/4.50	Aver.	5.64	2.65	2.43	213	92
N = 11	Max.	6.1	3.0	3.0	246	100
RS'73 11.00 m	Min.	4.5	2.3	2.1	178	78
0.30/4.60	Aver.	5.72	2.78	2.47	206	89
N = 15	Max.	6.5	3.0	2.9	231	103

Barley. Hordeum is well represented at Ras Shamra, but in general preservation is rather poor. Many grains are corroded, deformed, swollen (puffed) or broken, which hampered further identification. Most likely the Ras Shamra barley is all of the hulled type. As for the shape, a few grains could possibly be of naked barley, but they do not show the transversely wrinkled surface pattern characteristic of naked barley.

As for the question of two-rowed (*H. distichum*) or many-rowed (*H. vulgare*) barley, the following should be remarked. Among the fairly well pre-

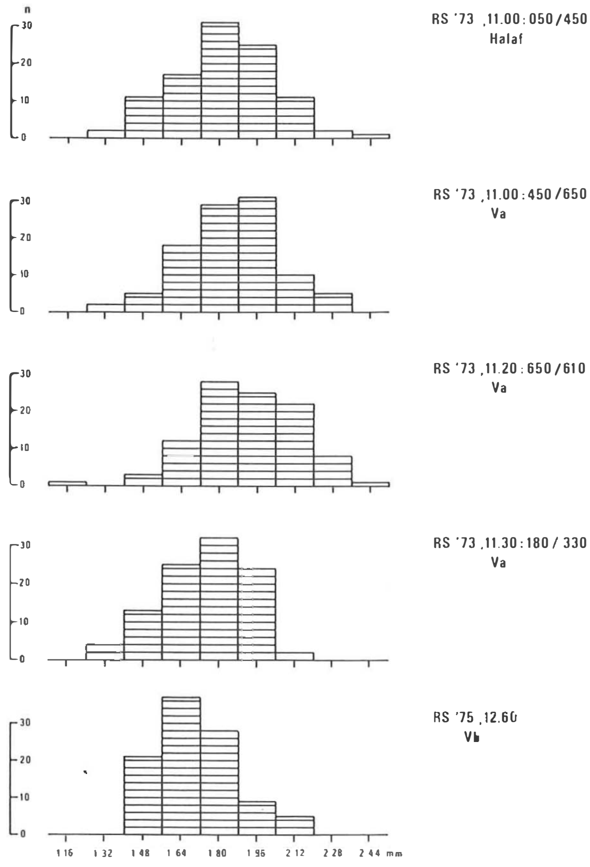

Fig. 5. Frequency distribution histograms for the width of spikelet forks of *Triticum dicoccum/monococcum*.

Table 6. Width of spikelet forks of *Triticum dicoccum/monococcum*.

	11.00 m 0.50/4.50 Halaf	11.00 m 4.50/6.10 Va	11.20 m 6.50/6.10 Va	11.30 m 1.80/3.30 Va	12.60 m south balk Vb
Min.	1.4	1.3	1.2	1.3	1.4
Aver.	1.82	1.85	1.92	1.74	1.71
Max.	2.5	2.3	2.5	2.2	2.2

Table 7. Greatest diameter of *Lens culinaris* in samples from phase V levels.

	Va (N = 38)	Vb (N = 18)	Vc (N = 25)
Min.	1.8	2.3	2.3
Aver.	2.84	2.81	2.96
Max.	3.6	3.2	3.4

Table 8. Dimensions of *Linum usitatissimum* from phase Va levels (11.40 and 11.60 m). N = 16

	L	corrected for 13 % shrinkage	B	corrected for 21 % shrinkage
Min.	2.6	(3.0)	1.4	(1.8)
Aver.	3.12	(3.59)	1.60	(2.03)
Max.	3.4	(3.9)	1.9	(2.4)

served grains, slender, symmetrical specimens are predominant, suggesting that *Hordeum distichum* is concerned here. In addition to the slender grains, plump specimens are also found, particularly among the poorer preserved grains. This could possibly point to *H. vulgare*, but on the other hand the rachis internodes do not suggest that many-rowed barley is represented. The internodes which are preserved well enough to determine the type are all of *Hordeum distichum*. The sterile, lateral florets were (shortly) pedicellate (fig. 8: 2).

If *Hordeum distichum* was not already the only type of barley grown by the prehistoric farmers of Ras Shamra, it must at least have been an important crop plant. Because of the generally poor preservation no dimensions have been taken. For a limited number of samples only one or at most a few grains would have been suitable for measuring.

Cereal grain fragments. It has not been attempted to attribute the cereal grain fragments to either barley or wheat; for the smaller fragments this would even have been impossible. The grain fragments have been converted to estimated numbers of complete kernels on the basis of 0.0074 gram per grain. This mean cereal grain weight was obtained for barley and wheat from Ramad (van Zeist & Bakker-Heeres, 1982(1985): 4.7.).

Legumes. Lentil (*Lens culinaris*) must have been an important crop plant, particularly in the pre-Halaf levels. There are no significant differences in size between the lentils from Va, Vb and Vc levels (table 7).

Field peas (*Pisum sativum*) occur in low numbers. Only occasionally more than one pea was recovered from a sample. A few seeds from Vb and Vc levels attributed to *Pisum* are quite small, *viz.* 2.6-2.8 mm.

A few *Lathyrus* seeds were found. They could be of wild *Lathyrus cicera* as well as of domestic *L. sativus*.

Linseed. The linseeds from Ras Shamra have been discussed in an earlier paper (van Zeist & Bakker-Heeres, 1975). The information in the latter paper needs correction. The measured specimens are not from a depth of 10 m, but from levels at 11.40 and 11.60 m (phase Va) dated to 5750-5250 B.C. The dimensions of the phase Va linseeds (table 8) correspond to those from Ramad (van Zeist & Bakker-Heeres, 1982(1985): table 21). The corrected size of the Ramad and Ras Shamra linseeds points to domestic *Linum usitatissimum*. For a discussion of the correction for shrinkage and of the species determination, see van Zeist & Bakker-Heeres (1975 and 1982(1985): 4.8.).

Phases Vb and Vc yielded a few damaged linseeds which, with some reserve, have been attributed to *Linum usitatissimum*.

3.2. Wild plants

Below seeds and fruits of wild plants are treated in alphabetical order.

Ammi majus (Umbelliferae). In three samples from phases Va and Vb a pair of unripe, connate *Ammi majus* L. fruits was found. Similar fruits have been described and depicted for Ramad (van Zeist & Bakker-Heeres, 1982(1985): fig. 30: 12).

Asphodelus (Liliaceae). Three-faced (triquetrous) seeds, pointed at both ends, with sharp ridges. The concave sides are transversely undulated and show a granular surface structure. Four damaged seeds were recovered, the length of two of which must have been at least 3.2 and 3.6 mm, respectively. *Asphodelus microcarpus* Salzm. et Viv. is found in fields and other disturbed habitats; it is particularly common on overgrazed terrains.

Bupleurum subovatum-type (Umbelliferae). Split fruits, elliptic in outline, with rounded upper and lower ends. The domed dorsal side has five sharp ribs. The surface of the fruit is irregularly transversely ridged. Only one fruit of this type was found (RS'73, 11.30: 050/600) (fig. 7: 6). Dimensions: 2.5×1.5×1.4 mm. Shape and size of the *Bupleurum* fruit compare to those of *B. subovatum* Link. fruits present in the seed reference collection of the B.A.I.

Capparis (Capparidaceae). In three phase Vc samples from the exposed north section of the SC sounding (table 3) *Capparis* seeds were found; in the sample from a depth of 13.30 m even in quite a great number. The size of the seeds, c. 3-3.5 mm, compares to that of modern *Capparis spinosa* L. seeds in the B.A.I. seed reference collection.

A closer inspection of the seeds revealed a curious fact. Some of the seeds were carbonized; sometimes remains of charred fruit flesh was still adhering to the seeds. Other seeds were not carbonized, while some specimens give the impression of having been in contact with fire without becoming wholly carbonized. The single *Capparis* seed in the sample at a depth of 14.20 m is uncarbonized.

The combination of charred, semi-charred and uncharred specimens casts doubt on the antiquity of the *Capparis* seeds. One is rather inclined to assume that the *Capparis* seeds are not Neolithic but of modern date. Thus suspicion against the antiquity of the *Capparis* seeds is fostered by the fact that an almost complete *Vitis* pip in the sample with the great number of *Capparis* seeds has a long stalk, indicating that it is of domestic grape (*Vitis vinifera* ssp. *vinifera*). The same sample yielded 7 modern (uncarbonized) *Euphorbia* seeds. The authors take the line that the Ras Shamra *Capparis* seeds are not Neolithic.

Cornus mas (Cornaceae). One only slightly damaged fruit stone of *Cornus mas* L. was found (RS'73, 11.30: 050/300). Although it is unlikely that Cornelian cherry occurred in the vicinity of the site, there is no reason to doubt the identification. In the carbonized specimen, elliptic in outline and measuring 11.5×6.8 mm, the linear scar at the lower end of the stone is still visible.

Coronilla (Leguminosae). Two samples from the 11.65 m level yielded each one damaged *Coronilla* seed. The bacular seeds are slightly curved. The length could not be determined, but the seeds must have been at least 3 mm long. The width is 0.6-0.7 mm.

Echium (Boraginaceae). Squat nutlets, obliquely ovate in outline, with a truncated base and a rather short, pointed apex. The rounded triangular base has a distinct collar. Ventral and dorsal side with a longitudinal keel; surface tuberculate (fig. 8: 1). A small number of *Echium* fruits was found. Dimensions of five specimens: 3.15(3.0-3.4)×2.4(2.2-2.6) mm.

As has been discussed in previous papers, the presence of boraginaceous fruits in archaeological sites poses some problems. It can only seldom be established whether they have been in contact with fire and also unburnt nutlets may have been preserved for a very long time. The condition of the *Echium* nutlets from Ras Shamra is such that these fruits are certainly not of modern origin.

Ficus (Moraceae). In addition to the fig pips, one complete but deformed fruit was recovered (table 2, 11.30 m). Dimensions: 22.5×21.5×10.5 mm. At the base of the carbonized fig, an elliptic cavity indicates the place of the attachment of the fruit stalk.

Lolium (Gramineae). *Lolium* is well represented at Ras Shamra; particularly the Halaf samples yielded considerable numbers of *Lolium* caryopses. Most of the *Lolium* caryopses are of the *perenne/rigidum*-type. The dimensions and index values of the *Lolium* spec. fruits from Ras Shamra are shown in table 9 and figure 6.

In addition, small numbers of *Lolium temulentum*-type fruits were found. With respect to this fruit type, the following should be remarked. The 'small-sized *Lolium temulentum*' fruit type described for Ramad (mean length 2.74, 2.93 and 2.95 mm) should most probably be attributed to *L. remotum* Schrank (van Zeist & Bakker-Heeres, 1982(1985): 5.13.), which species is closely related to *L. temulentum* L. *L. remotum* caryopses with a mean length of 2.58 mm are described by Kroll (1983) for Kastanas in Greece; the mean length of

Table 9. Dimensions and index values of *Lolium* spec. and *Phalaris* fruits.

		L	B	T	L/B	T/B
Lolium spec.						
RS'73 11.00 m	Min.	3.2	1.2	0.8	211	56
0.50/4.50	Aver.	3.94	1.42	1.05	277	74
N = 100	Max.	4.8	1.7	1.3	333	94
Phalaris						
RS'73 11.00 m	Min.	1.8	0.6	0.95	237	137
4.50/6.50	Aver.	1.83	0.70	1.05	264	150
N = 7	Max.	1.9	0.75	1.15	321	181
RS'73 11.30 m	Min.	2.0	0.55	0.95	319	150
1.80/3.30	Aver.	2.06	0.61	1.03	338	170
N = 7	Max.	2.15	0.65	1.15	371	207

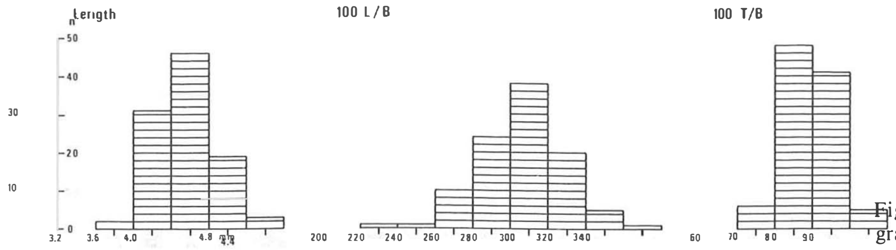

Fig. 6. Frequency distribution histograms for caryopses of *Lolium* spec.

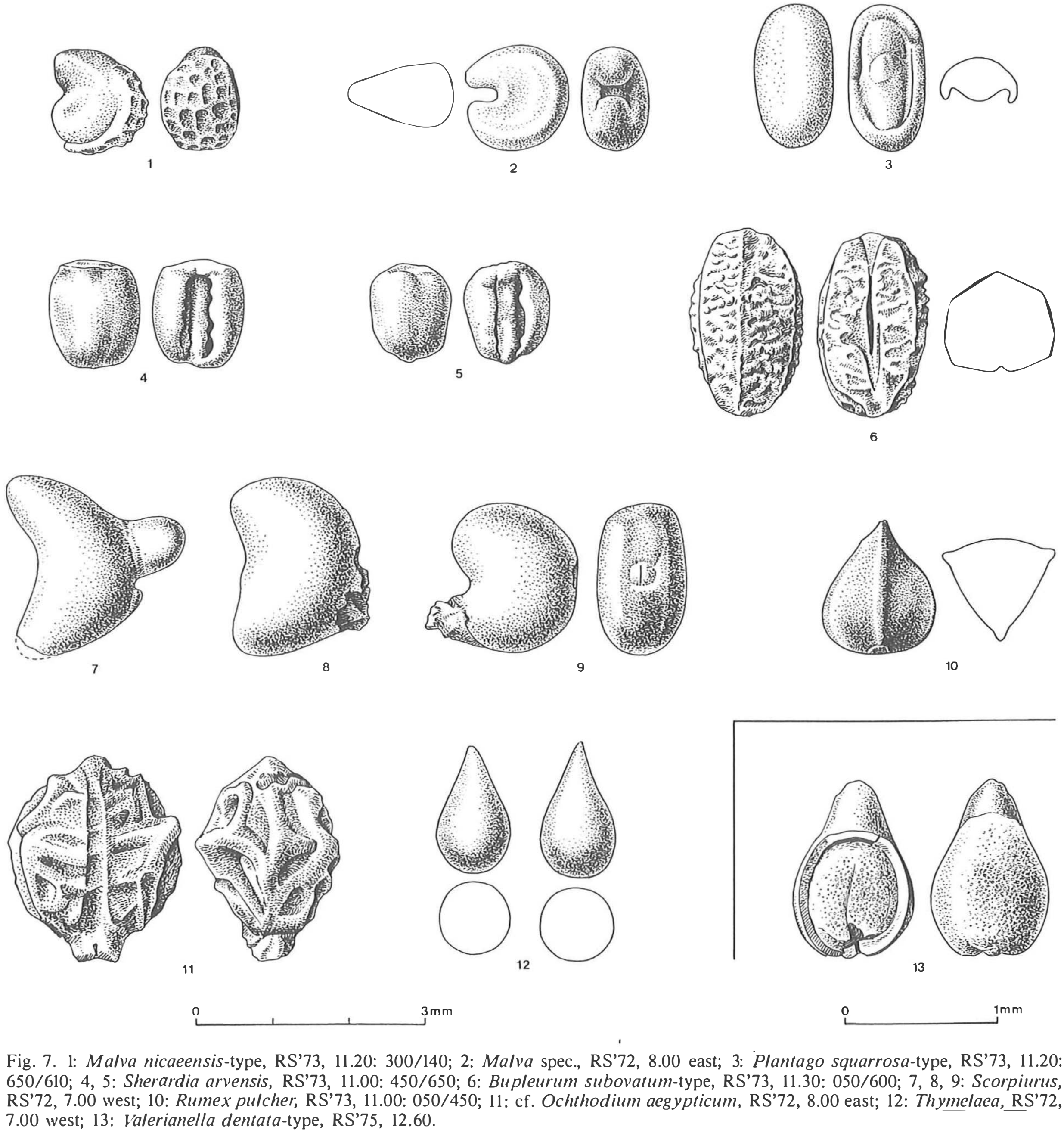

Fig. 7. 1: *Malva nicaeensis*-type, RS'73, 11.20: 300/140; 2: *Malva* spec., RS'72, 8.00 east; 3: *Plantago squarrosa*-type, RS'73, 11.20: 650/610; 4, 5: *Sherardia arvensis*, RS'73, 11.00: 450/650; 6: *Bupleurum subovatum*-type, RS'73, 11.30: 050/600; 7, 8, 9: *Scorpiurus*, RS'72, 7.00 west; 10: *Rumex pulcher*, RS'73, 11.00: 050/450; 11: cf. *Ochthodium aegypticum*, RS'72, 8.00 east; 12: *Thymelaea*, RS'72, 7.00 west; 13: *Valerianella dentata*-type, RS'75, 12.60.

L. temulentum fruits in various samples from that site ranges from 3.87 to 4.26 mm. Length and breadth of 15 *L. temulentum*-type fruits from RS'73, 11.00: 030/460 and 11.00: 050/450 are 3.65 (3.2-4.1) and 1.53(1.3-1.8) mm, respectively; L/B index: 240(220-258).

The distinction between *L. perenne/rigidum* and *L. temulentum*-type caryopses was sometimes rather arbitrary. One wonders whether the *L. temulentum*-type fruits at Ras Shamra are, in fact, deformed *L. perenne/rigidum* caryopses.

Malva (Malvaceae). Wedge-shaped seeds, reniform in outline, with a deep hilar notch. Smooth seed wall. Most of the *Malva* seeds have a flat dorsal face. In one specimen (from RS'73, 11.20: 300/140) the wall of the one-seeded fruit was still in part preserved. The reticulate structure at the dorsal face (fig. 7: 1) resembles that in *Malva nicaeensis* All. mericarps. The charred *M. nicaeensis*-type seeds (1.24(1.0-1.4)×1.15(1.0-1.4) mm) are smaller than modern, non-carbonized *M. nicaeensis* seeds (greatest diameter 1.5-1.8 mm). *Malva nicaeensis* is a plant from waste places and roadsides (Zohary, 1972: p. 317).

Two *Malva* seeds from RS'72, 7.00 m have a domed dorsal face (1.8×1.6 and 1.6×1.5 mm) suggesting that *M. aegyptica* L. could be concerned here.

Medicago (Leguminosae). Among the crescent-shaped, laterally compressed *Medicago* seeds from Ras Shamra two size classes can be distinguished. The seeds of the smaller type are 1.9 to 2.4 mm long (6 specimens), those of the larger type 3.1 to 3.5 mm (3 specimens). RS'72, 7.80 m yielded a *Medicago* pod, which, however, does not allow a species identification.

Cf. *Ochthodium aegypticum* (Cruciferae). A few Cruciferae fruits (cilicles) from Halaf samples have been attributed to *Ochthodium aegypticum* (L.)DC. with some reserve. As no modern reference material of this species was available, the identification is based upon illustrations and descriptions in the literature, in particular Davis (1965: p. 253, 347). The two-seeded fruits are circular to elliptic in outline; largest diameter of the charred specimens 2.2-2.5 mm. On the surface a network of narrow ridges and some spine-like tubercles (fig. 7: 11). *Ochthodium aegypticum* is a common field weed in western Syria (Post & Dinsmore, 1932: vol. 1, p. 112; Mouterde, 1970: p. 102).

Olea (Oleaceae). One complete olive stone (10.5× 6 mm) and a fairly great number of stone fragments were recovered. It is not assumed that olives were cultivated already in the sixth and fifth millennia B.C. Zohary & Spiegel-Roy (1975) suggest that olive growing started in the early fourth millennium B.C.

Wild olives could have been collected in the vicinity of prehistoric Ras Shamra. *Olea europaea* L. var. *oleaster* (Hoffmanns. & Link)DC. (syn: var. *sylvestris* (Miller)Lehr.) is a constituent of the lower Eu-Mediterranean vegetation zone, at elevations up to 300 m.

Phalaris (Gramineae). This grass species is rather well represented at Ras Shamra. The *Phalaris* fruits at Ras Shamra (table 9) are, on average, somewhat larger than those from Aswad (van Zeist & Bakker-Heeres, 1982(1985): table 36). Because of poor preservation only few caryopses were suitable for measuring.

Pistacia (Anacardiaceae). In addition to nutshell fragments, three intact *Pistacia* nuts were found (3.4×3.2×2.6, 3.2×3.0×2.6, 3.3×3.6×2.6 mm). The shape of the nuts does not point to *P. lentiscus* L., but they are of the *P. atlantica/palaestina*-type. Most likely the Mediterranean *Pistacia palaestina* Boiss. is concerned here. Just as those of *P. atlantica* the fruits of *P. palaestina* are edible and are still sold in markets (Zohary, 1972: p. 298). Compared to Ramad, the numbers of pistachio remains at Ras Shamra are very small, suggesting that this fruit was not consumed at a large scale. One may assume that *P. palaestina* was quite common in the vicinity of the site.

Plantago squarrosa-type (Plantaginaceae). Only one seed (RS'73, 11.20: 650/610), elliptic in outline (2.0×1.1 mm), with rounded upper and lower end. In the broad furrow at the ventral side a longitudinal ridge on which the remains of the hilum are visible (fig. 7: 3). The surface is smooth. The Ras Shamra seed shows a fair resemblance to those of *Plantago squarrosa* Murr.

Rumex (Polygonaceae). Most of the *Rumex* nutlets from Ras Shamra have been attributed to *R. pulcher* L., a species from disturbed habitats and damp places (fig. 7: 10). Six *R. pulcher* fruits were suitable for measuring: 1.83(1.6-2.2)×1.51(1.4-1.7) mm.

Rumex nutlets which differ from those of *R. pulcher* are indicated as *Rumex* spec.

Scorpiurus (Leguminosae). Crescent-shaped seeds. The small, circular to elliptic hilum is found in the middle of the outer side (fig. 7: 9). In most of the carbonized specimens the hilum is not preserved, but in various seeds at the place of the hilum a protuberance is present: the contents of the seed has poured out (fig. 7: 7, 8). Most of the charred *Scor-*

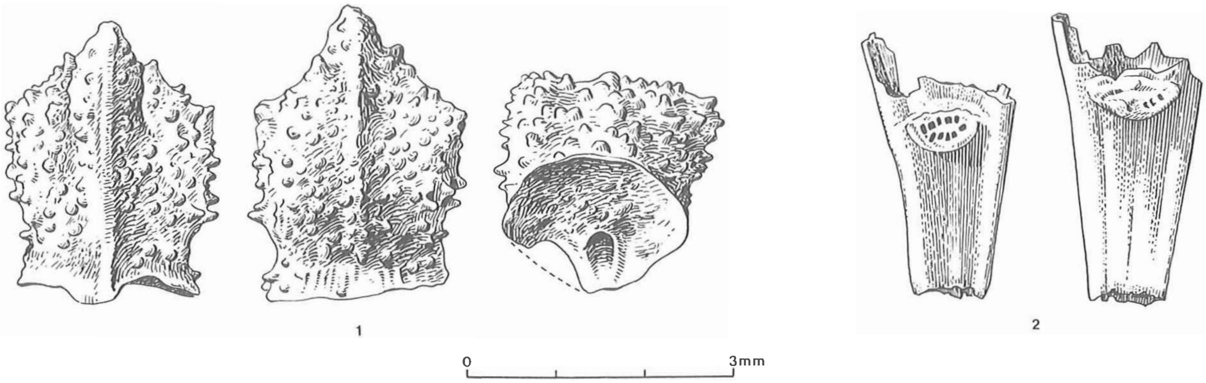

Fig. 8. 1: *Echium*, RS'73, 11.00: 030/460; 2: *Hordeum distichum* rachis internodes, RS'73, 11.00: 050/450.

piurus seeds are more or less severely deformed and swollen. Length and breadth of 9 seeds are 2.55 (1.8-3.4)×1.48(1.2-1.8) mm, respectively. A few *Scorpiurus* species are reported for Syria (Mouterde, 1970: pp. 378-379). They occur in fields.

Sherardia arvensis (Rubiaceae). The carbonized fruits are broadly elliptic in outline, with a truncated apex. In the broad furrow at the ventral side a longitudinal ridge is present. The dorsal side is domed (fig. 7: 4, 5). In some charred specimens short white lines are present on the surface. Dimensions of 8 fruits: 1.62(1.4-2.1)×1.29(1.0-1.6)×1.06 (0.8-1.2) mm. *Sherardia arvensis* L. is a field weed.

Thymelaea (Thymelaeaceae). Various samples yielded one or a few *Thymelaea* fruits. The small fruits have a rounded base and an acuminate, elongated apex (fig. 7: 12). The smooth fruit wall is shiny. Dimensions of 15 fruits: 1.78(1.6-2.0)×1.05 (1.0-1.2) mm. The Ras Shamra *Thymelaea* fruits are not of *T. hirsuta* L., a common shrub of Mediterranean maquis vegetation, but of the type provisionally indicated as *T. pubescens* (L.)Meissn. (van Zeist & Bakker-Heeres, 1982(1985): 5.26.) For lack of reference material a more exact identification cannot be given.

Trifolium-type (Leguminosae). Small leguminous seeds (1.1-1.6 mm long) in the Halaf samples from the 7.00 and 8.00 m levels have tentatively been attributed to *Trifolium*. The shape of some of the seeds is reminiscent of *Melilotus*, but other seeds point more to *Trifolium*. The generally poor preservation (deformation) prevents a more accurate identification. One similar seed was recovered from a phase Va sample (table 2).

Valerianella dentata-type (Valerianaceae). One fruit of this type was recovered (RS'75, 12.60 m). The fruit is ovate in outline, with an elongated apex. The dorsal side is domed and the ventral side shows an almost circular, collar-like ridge (fig. 7: 13). The surface of the charred fruit is covered with small, white dots. Dimensions: 1.2×0.8×0.7 mm. Shape and size of the fruit point to *Valerianella dentata* (L.)Poll. (*V. morisonii* DC.) which species is found on cultivated land and in woodland (Davis, 1972: p. 580).

Vitis (Vitaceae). A small number of carbonized grape pips *(Vitis vinifera* L.) was recovered. The pips are of the plump type, with a short stalk, except one specimen in RS'75, 13.30 m (see *Capparis*). Four pips of the morphologically wild type measure: 4.4×4.0, 4.0×3.6, 3.8×3.1 and 3.4×2.6 mm.

Ziziphora (Labiatae). One damaged *Ziziphora* fruit was recovered (RS'73, 11.60: 550/150). This specimen (2.2 mm long) is larger than those from Ramad and Aswad and from Erbaba which measure from 1.3 to 1.7 mm. The size of the Ras Shamra fruit matches that of *Ziziphora capitata* L. fruits.

4. DISCUSSION

4.1. The nature of the samples

As for the nature of the samples, comments that have been made for the sites in the Damascus area (van Zeist & Bakker-Heeres, 1982(1985): section 6) could be repeated here. There are no samples of which the botanical content represents one specific stage of crop processing or food preparation. Part of the samples were taken from the exposed surface during excavation, but usually from rather vague features, such as ashy soil, or from places where charred seeds were observed with the naked eye.

The plant remains in most if not all samples are of mixed origin. The great numbers of *Triticum* spikelet forks and glume bases in a fair number of samples and the great quantities of *Lolium* caryopses in most of the Halaf samples suggest that threshing refuse and crop-cleaning residues are among the charred vegetable remains. It will be evident that the mixed origin of the samples constitutes a serious restriction to the interpretation of the archaeobotanical data in terms of domestic activities. As a matter of fact, the Ras Shamra material allows only conclusions on the crop-plant assortment and some speculations on field weeds. However, as the amount of palaeobotanical data for prehistoric (and early-historical) sites in the Near East is still very limited, every piece of factual evidence is useful.

The question of how plant remains may have arrived in the settlement will not be touched upon here. On the other hand, the seed frequencies give occasion to some comments.

4.2. Seed frequencies

A superficial inspection of tables 1-4 shows already that there are considerable variations in the numbers of seeds and fruits between samples and between groups of samples. For the Neolithic sites in the Damascus basin marked differences in mean seed frequencies between sites and between phases within one site have been established. Also for Ras Shamra mean seed frequencies per volume of soil have been determined.

The numbers of seeds have again been converted to those in 10 litres of soil. The volume of the Ras Shamra soil samples floated for plant remains ranged from ⅓ of a basket to 2 rubber baskets. According to the field notes of the 1973 campaign one basket contained 10-12 litres of soil, whereas for 1975 a volume of 13 litres per basket has been recorded. The content of one basket has arbitrarily been taken as 12 litres of soil. The seed frequencies per sample and per group of samples (archaeological phase) are presented in table 10.

From table 10 it is evident that the seed concentration is, on average, very low in the phase Vc samples to increase in the deposits of the succeeding habitation phases. The mean seed frequency of the Halaf samples is about 90 times higher than that of the phase Vc samples. As has been discussed in an earlier paper, no satisfactory explanation for the differences in seed frequencies can be presented. It could be that in the lowermost layers the accumulation of soil had been much faster than in the upper prehistoric levels. For Ras Shamra this would imply a progressively decreasing accumulation rate of occupational fill. Assuming that the charred plant material was primarily waste, it could be that in the lower levels most of the vegetable refuse was disposed of outside the settlement or at least at another place than the area of the SH excavation. It goes without saying that these suggestions are not particularly convincing.

For the Vc levels there are two series of samples. The 1975 samples form a consecutive series from an exposed section (coupe sud) without distinct traces of archaeological features, whereas for the 1976 samples areas which looked most promising from a palaeobotanical point of view could be selected. It may be no surprise that the mean seed concentration in the 1976 samples is significantly higher than that in the 1975 samples.

Average seed frequencies of 25 and 6 established

Table 10. Seed frequencies per 10 litres of soil.

Halaf		Vb	
W. section 7.00	634	12.40	19
N. section 7.80	241	12.60	84
E. section 8.00	709	12.80	25
W. section 8.75	453	12.90	19
10.00 fireplace SH 324	373	13.00	11
NE area	18	13.10	6
E area	31	13.20	11
near SH 309(1)	488	Mean	25
near SH 309(2)	593		
10.75-11.00 SH 359	58	Vc (1975)	
11.00 0.50/4.50	993		
0.30/4.60	810	13.30	8
Mean	450	13.40	6
		13.50	2
Va		13.60	1.5
		13.70	2
11.00 4.00/1.00	48	13.80	0.5
4.60/2.50	71	13.90	2
3.30/5.50	22	14.00	0.3
4.50/6.50	249	14.10	3
11.10 1.40/2.50	92	14.20	0.5
3.50/2.60	110	14.30	4
3.00/6.60	77	14.40	1
0.30/8.90	30	Mean	2.5
0.30/9.00	20		
1.50/10.80	30	Vc (1976)	
11.20 3.00/1.40	273		
6.50/6.10	70	13.40	8
11.30 2.80/2.10	139	13.50	2
1.80/3.30	226	13.60	1.5
6.70/5.20	5	13.70	2
0.50/6.00	59	13.80	20
11.40 6.50/1.50	126	13.90	5
11.60 3.50/0.50	204	14.00	11
5.50/1.50	73	14.10	9
2.80/2.30	71	14.20	3
3.00/4.50	31	14.30	1
1.50/6.00	23	14.40	15
7.30/7.00	116	14.50	1.5
11.65 1.00/2.60	10	14.60	1
1.00/6 00	15	Mean	6
0.60/11.00	12		
Mean	85		

for the Vc levels are low, but apparently no exception for archaeological deposits. Thus, the samples from a sounding at Khirokitia on Cyprus yielded, on average, only 1.5 seed per 10 litres of soil (Waines & Stanley Price, 1975-1977).

4.3. Food plants

4.3.1. *Cultivated plants*

As has already been dicussed in section 3.1. and as is clear from tables 1-4, among the cereal crops of the Ras Shamra farmers emmer wheat (*Triticum dicoccum*) and two-rowed hulled barley (*Hordeum distichum*) were the most important species. Einkorn wheat (*Triticum monococcum*) and free-threshing wheat (*Triticum durum/aestivum*) were of minor importance and may not have been grown as separate crops. The seed frequencies suggest that lentil (*Lens culinaris*) was the predominant pulse crop with field pea (*Pisum sativum*) in second. The complete absence of bitter vetch (*Vicia ervilia*) should be noticed. The quantitative role of linseed (*Linum usitatissimum*) in the plant husbandry is still obscure. Linseed cultivation could with certainty be attested from phase Va levels onwards, but only from one sample (table 2) an appreciable number of seeds of this type was recovered.

The occupation deposits, of which charred vegetable remains are the subject of this investigation, cover a period of about 2000 years (see 1.2.). It is obvious to examine whether in the course of time changes in the proportions of the crop plants took place. To that end the mean percentages of the crop-plant seeds and fruits per archaeological phase have been determined (table 11). For the way in which the mean percentages have been determined the reader is referred to the paper on the Neolithic sites in the Damascus basin. It should be remembered here that of samples with less than 20 crop-plant seeds no percentages were determined, so that the number of samples indicated in table 11 may be less than the total number of samples in the phase concerned. As only few of the phase Vc samples yielded at least 20 crop-plant seeds, the mean percentages for this phase are based upon the total numbers of seeds.

Einkorn wheat and free-threshing wheat have not been established for phase Vb and Vc levels. In view of the very low numbers of more or less complete cereal grains recovered from these levels it may be premature to conclude that both wheat types did not yet occur during phases Vc and Vb. Among the cereals, emmer wheat shows the highest percentages in all archaeological phases. Most striking, however, are the changes in the proportions of cereals and pulses. In the lower levels (phase Vc) the mean pulse-crop percentage is higher than that of the cereals. In the succeeding phases the pulse-crop proportions decrease conspicuously, down to very low values in the Halaf samples. The archaeobotanical data suggest that in the early stages of habitation pulses, particularly lentil, were at least as widely grown as grain. The importance of pulses relative to cereals would have diminished greatly in the course of the prehistoric habitation of the site. A similar behaviour of the pulse-crop proportions has also been established at Aswad and Ghoraifé, and the question has been raised whether this could be an artifact of the seed preservation rather than

Table 11. Mean percentages of crop plant seeds and fruits per archaeological phase. For the calculation of the mean percentages, see 4.3. N = total number of seeds and fruits per archaeological phase.

	Halaf		Va (1973)		Vb (1975)		Vc (1975)		Vc (1976)	
Number of samples	10		20		6		12		13	
	Σ %	Mean %	Σ %	Mean %	Σ %	Mean %	N %	Mean %	N %	Mean %
Triticum monococcum	2.7	0.3	1.8	0.1	–	–	–	–	–	–
Triticum dicoccum	299.6	30.0	271.8	13.6	23.0	3.8	1	2.0	5	3.6
Triticum durum/aestivum	5.4	0.5	8.0	0.4	–	–	–	–	–	–
Hordeum distichum	146.4	14.6	107.5	5.4	17.4	2.9	–	–	2	1.4
Cereal grain fragments	511.5	51.2	1215.7	60.8	401.2	66.9	20	40.4	35	25.1
Σ Cereals		96.6		80.3		73.6		42.4		30.1
Pisum	2.3	0.2	16.0	0.8	4.8	0.8	3	6.1	3½	2.5
Lens	31.2	3.1	318.5	15.9	151.2	25.2	25	50.5	93	66.7
Lathyrus	–	–	4.2	0.2	–	–	½	1.0	–	–
Σ Pulses		3.3		16.9		26.0		57.6		69.2
Linum (usitatissimum)	0.6	0.06	55.7	2.8	2.3	0.4	–	–	1	0.7
Sum of seeds and fruits							49½		139½	

the reflection of actual changes in the proportions in which the plants were cultivated. The Ras Shamra evidence, with a more or less continuous decline in pulse-crop proportions, would plead more in favour of actual changes in the relative importance of cereals and legumes in the plant husbandry.

One wonders to what extent the Eu-Mediterranean climatic conditions (see 1.3.) may have determined the crop-plant assortment of the Ras Shamra farmers. Reflections in this respect should remain confined to phases Va and IV (Halaf). From phase Vb and Vc levels too few seeds and fruits were recovered to guarantee that all seed-crop plants grown in those periods have, indeed, been established.

For a comparison with phase Va at Ras Shamra, the sixth millennium B.C. sites of Cape Andreas-Kastros (van Zeist, 1981) and Khirokitia (Waines & Stanley Price, 1975-1977) in Cyprus are considered. These sites are, as Ras Shamra, situated in the Eu-Mediterranean zone. There is a difference in precipitation; for Latakia near Ras Shamra a mean annual rainfall of nearly 800 mm is recorded, whereas for Cape Andreas-Kastros and Khirokitia precipitation is 400-500 mm annually.

The crop-plant husbandry at Ras Shamra corresponds to that of both Cypriotic sites in that naked barley (*Hordeum vulgare* var. *coeleste*) and bitter vetch (*Vicia ervilia*) are absent. Free-threshing wheat (*Triticum durum/aestivum*) was not recorded for Khirokitia and Cape Andreas-Kastros and is scarcely represented at Ras Shamra. Was this wheat type perhaps of minor importance in the coastal region of mainland Southwest Asia, in consequence of which it was not introduced to Cyprus by the earliest farmer settlers? On the other hand, in the inland sixth millennium B.C. sites of Hacilar (Helbaek, 1970), Çatal Hüyük (Helbaek, 1964) and Erbaba (van Zeist & Buitenhuis, 1983), free-threshing wheat, naked barley and bitter vetch were common crop plants. Could this indicate that the Eastern Mediterranean coastal climate is not or less suitable for the latter species? Some caution in this respect is required. Thus, the scarcity of einkorn wheat at Ras Shamra, this in contrast to the sites from the interior of Anatolia mentioned above, could also be explained in terms of less favourable climatic conditions for this wheat species in coastal areas. However, at both sites in Cyprus the proportions of *Triticum monococcum* are quite high, implying that there it must have been an important crop.

A comparison of the Halaf crop-plant assortment at Ras Shamra with that of other sites of the same cultural affinity is hardly possible. So far only for the Halafian site of Girikihaciyan, in Southeast Anatolia, a more substantial body of palaeobotanical data has been published (van Zeist, 1979-1980).

4.3.2. *Wild food plants*

Of various wild plants attested for Ras Shamra, the seeds, leaves or roots may have been consumed by the inhabitants of the site. Unfortunately, this is usually impossible to demonstrate. Only for the wild edible fruits represented in the site one may confidently assume that they had been gathered for human consumption. It is likely that all wild fruit resources at not too great a distance from the site were exploited, but one should not rule out the possibility that human preference played a part in the representation of the wild fruit remains in the charred seed record.

It looks as if wild olive was much in demand. The availability of this source of vegetable fat must have compensated for the scarcity of wild almond in the Eu-Mediterranean vegetation. It may be remembered that at Ramad wild almond must have constituted an important source of vegetable fat, this in addition to wild pistachio. *Pistacia* nutshell remains are not particularly numerous at Ras Shamra, at least not compared to the great quantities of remains found at Ramad. For Ramad *Pistacia atlantica* is the most likely species, whereas at Ras Shamra it must have been *P. palaestina* (see 3.2.). The fruits of both *Pistacia* species are edible. Could the less intensive collecting of *Pistacia* fruits at Ras Shamra indicate that because of the presence of wild olive there was less need for pistachio? One could also speculate that *P. palaestina* was no common constituent of the natural vegetation, this in contrast to the role of this small tree in the present-day degraded remnants of Eu-Mediterranean vegetation.

4.4. The weeds

The weeds at Ras Shamra give occasion to some comments of local as well as of more regional nature. From the ratios between the numbers of crop-plant seeds and fruits and those of (potential) field weeds, only with the utmost reserve can conclu-

Table 12. Mean ratios between seed and fruit frequencies of cultivated plants and wild species (fruit trees and shrubs excluded). For explanation, see 4.4.

		Ratio
Phase IV (Halaf),	N = 12	0.99
Va (1973),	N = 22	4.64
	N = 20	3.34 (2 samples with very few weed seeds excluded)
Vb (1975),	N = 6	3.94
Vc (1975)		3.67
Vc (1976)		6.98

sions be drawn on the conditions of the fields, that is to say, whether the fields were weed-infested or rather free of weeds as a result of roguing. On the other hand, marked changes in the crop-plant/weed ratios may mean something. The mean crop-plant/weed ratios for the prehistoric habitation phases are shown in table 12. For the calculation of these ratios all weed types have been included, implying that not only field weeds are concerned.

The way the ratios have been calculated is largely the same as that for the mean crop-plant percentages (4.3.1.). For samples with at least 20 seeds of crop plants and weeds the ratios were calculated and thereupon the mean ratios per phase were determined. Of phase Vc only few samples yielded enough seeds for calculating the crop-plant/weed ratio. In this case the actual numbers of seeds per series of samples (1975 and 1976 series) were added and subsequently the ratios between both groups of seeds were determined.

There are no great differences in the crop-plant/weed ratios between levels Va, Vb and Vc. On the other hand, in the Halaf samples the proportion of weeds is, on average, much higher than that in the preceding periods. This could point to a strong expansion of field weeds, either in the sown fields or on fallow fields. This conspicuous increase in field-weed proportions is completely due to the great numbers of *Lolium* caryopses in the Halaf samples. One wonders whether due to other agricultural practices particularly *Lolium* became a noxious weed, if not a serious pest.

The number of weed-seed types established for Ras Shamra is markedly lower than that for Ramad. Moreover, some of the weeds demonstrated for Ras Shamra are not represented at Ramad. One wonders to what extent the differences in the weed flora of both sites could have been due to differences in environmental conditions. Ramad was situated in an almond-pistachio forest-steppe, *i.e.* a steppe vegetation with scattered trees and shrubs. The Ras Shamra area would naturally have been covered by Eu-Mediterranean forest and shrub vegetation. In the comparison of the weed floras a third site will be included, *viz.* Erbaba, in South-Central Anatolia (van Zeist & Buitenhuis, 1983). The natural vegetation in the vicinity of Erbaba must have been a rather open forest.

In table 13 the presence or absence of various weed types in the three sites is indicated. Some of the taxa listed in table 13 are usually not found in fields, *e.g.* Cyperaceae, but most of them are field weeds or potential field weeds. It has been attempted to specify the presence of seed types by an indication of their frequencies in the sites concerned. This classification is not satisfactory in that that variation within the category indicated by one plus-sign is too large: from one or a few seeds of a par-

Table 13. Weeds and possible low shrubs in three Near Eastern sites. r = one or a few to fairly many seeds in less than 10% of the samples; + = one or a few to fairly many seeds in at least 10% of the samples and/or many seeds in a few samples; ++ = many seeds in at least 10% of the samples.

	Ramad	Ras Shamra	Erbaba
Number of samples	47	74	70
Anchusa officinalis	-	-	r
Echium	-	r	-
Heliotropium	r	-	-
Lithospermum arvense	+	+	+
Lithospermum tenuiflorum	+	r	-
Cerastium-type	r	-	-
Gypsophila	r	-	-
Saponaria-type	-	-	+
Silene spec.	+	-	+
Silene colorata-type	r	-	-
Stellaria	-	-	r
Vaccaria pyramidata	+	-	-
Chenopodium album	-	-	r
Helianthemum ledifolium-type	+	-	-
Helianthemum salicifolium-type	r	-	-
Centaurea	r	-	-
Crepis-type	r	-	-
Convolvulus	r	-	r
Alyssum	r	-	+
cf. Ochthodium	-	r	-
Carex cf. divisa	+	r	-
Eleocharis	-	r	r
Scirpus maritimus	+	+	r
Scirpus tabernaemontani-type	r	-	-
Cephalaria syriaca	r	-	-
Aegilops	r	r	-
Avena	+	+	-
Bromus	+	+	-
Echinaria	+	-	-
Eremopyrum	+	-	-
Hordeum spec.	r	-	-
Hordeum spontaneum	+	-	-
Lolium spec.	++	++	-
Lolium temulentum/remotum	+	+	-
Phalaris	+	+	-
Stipa	r	-	-
Triticum boeoticum	+	-	r
Gramineae indet.	+	r	r
Ajuga	-	-	r
Teucrium	+	-	r
Ziziphora	r	r	+
Astragalus	++	-	-
Coronilla	+	r	-
Medicago spec.	+	+	r
Medicago radiata	+	-	-
Melilotus	+	r	-
Onobrychis	+	-	-
Scorpiurus	-	+	-
Trifolium-type	-	r	-
Trigonella astroites-type	+	-	-
Vicia	+	+	+
Leguminosae indet.	+	r	r
Asphodelus	-	r	-
Bellevalia	+	+	-
cf. Ornithogalum	++	+	-
Liliaceae indet.	r	-	-
Malva(ceae)	r	+	r
Fumaria	r	-	-
Glaucium aleppicum-type	r	-	-

Table 13 (continued).

	Ramad	Ras Shamra	Erbaba
Plantago	+	r	r
Polygonum(aceae)	r	-	r
Rumex pulcher	+	+	-
Rumex spec.	+	r	r
Anagallis	-	-	r
Androsace maxima	+	-	-
Adonis	+	r	+
Crucianella	r	r	-
Galium	+	+	+
Sherardia	-	+	-
Hyoscyamus	-	-	r
Thymelaea	-	+	+
Ammi majus	+	r	-
Bifora	r	-	-
Bupleurum	r	r	-
Torilis nodosa-type	+	-	-
other Umbelliferae	r	-	r
Verbena officinalis	r	-	-

ticular type in only 10% of the samples to fairly great numbers of seeds in many samples of the site concerned. Moreover, the distinction between 'many' and 'fairly many' seeds is arbitrary. However, for our discussion the quantitative aspect is not of prime importance.

One could speculate that with the development and expansion of agriculture in the millennia after the start of plant cultivation, the number of field-weed species increased. In the various regions in which agriculture was introduced, weeds from the natural vegetation could adapt themselves to the environmental conditions in cultivated fields and subsequently be spread to other regions as field weeds. The local field-weed flora of a particular region would have been supplemented with weed taxa introduced from other regions. The data presented in table 13 do not support this hypothesis in that the numbers of weed taxa in sixth millennium B.C. Erbaba and Ras Shamra are smaller than that in late seventh millennium Ramad. One must assume that the great number of wild plant taxa represented at Ramad is primarily due to the steppic environment of the site. Steppe vegetation harbours a much greater number of annual and perennial weeds and low shrubs than forest vegetations do. Various taxa represented at Ramad could have formed part of the natural vegetation as well as have occurred as field weeds. On the other hand, it is striking that typical field-weed taxa, such as *Vaccaria pyramidata*, *Helianthemum ledifolium*, *Echinaria*, *Astragalus* (various annual *Astragalus* species are field weeds), *Trigonella astroites* and *Androsace maxima*, are absent at Ras Shamra and Erbaba. *Lolium*, *Phalaris* and *Bellevalia*, which must have been common weeds in the fields of the Ramad and Ras Shamra farmers, are not represented at Erbaba. Apparently, field weeds did not always spread rapidly, which may have been due to the infrequency of contacts between the various regions.

A few of the wild plant taxa listed in table 13 are confined to Ras Shamra. At present, *Asphodelus* (*microcarpa*) is common in Northwest Syria, in disturbed habitats, but absent from the Ramad and Erbaba areas. Why the field weeds *Sherardia arvensis*, *Scorpiurus* and *Ochthodium aegypticum* are not represented at Ramad and/or Erbaba must remain an unsolved question. Did these taxa perhaps develop into field weeds in the Northwest Syrian region? The study of Near Eastern local and regional field-weed floras in prehistoric and early-historical times could lead to interesting results.

5. ACKNOWLEDGEMENTS

Mr. H. de Contenson (Paris, Centre National de la Recherche Scientifique) rendered all possible assistance in the field work, provided additional information on the site and commented upon the manuscript. Mrs. Yvonne M. Koster took care of the sampling in 1976. The measurements of seeds and fruits were carried out by Mrs. R.M. Palfenier-Vegter. The drawings were executed by Mr. H.R. Roelink, while Mrs. G. Entjes-Nieborg assisted in the preparation of the manuscript. The English text was improved by Mrs. S.M. van Gelder-Ottway. The examination of the Ras Shamra plant remains was financially supported by the Netherlands Organization for the Advancement of Pure Research (Z.W.O.) (grant no. 85-83 to W. van Zeist).

The authors wish to express their sincere thanks to all who co-operated in this study.

6. REFERENCES

CONTENSON, H. DE, 1970. Sondage ouvert sur l'acropole de Ras Shamra. Rapport préliminaire sur les résultats obtenus de 1962 à 1968. *Syria* 47, pp. 1-23.

CONTENSON, H. DE, 1973. Le niveau halafien de Ras Shamra. Rapport préliminaire sur les campagnes 1968-1972 dans le sondage préhistorique. *Syria* 50, pp. 13-33.

CONTENSON, H. DE, 1977. Le Néolithique de Ras Shamra V d'après les campagnes 1972-1976 dans le sondage SH. *Syria* 54, pp. 1-23.

CONTENSON, H. DE, 1979. Recherches sur le Néolithique de Syrie (1967-1976). *Académie des Inscriptions et Belles-Lettres, Comptes Rendus* 1978, pp. 820-825.

CONTENSON, H. DE, 1982. Les phases préhistoriques de Ras Shamra et de l'Amuq. *Paléorient* 8, pp. 95-98.

DAVIS, P.H. (ed.), 1965- . *Flora of Turkey and the East Aegean Islands*. University Press, Edinburgh. Vol. 1, 1965; vol. 4, 1972.

HELBAEK, H., 1964. First impressions of the Çatal Hüyük plant husbandry. *Anatolian Studies* 14, pp. 121-123.

HELBAEK, H., 1970. The plant husbandry of Hacilar. In: J. Mellaart, *Excavations at Hacilar I*. Edinburgh University Press, pp. 189-244.

KROLL, H., 1983. *Kastanas. Ausgrabungen in einem Siedlungshügel der Bronze- und Eisenzeit Makedoniens 1975-1979. Die Pflanzenfunde.* Berlin.

LIERE, W.J. VAN, 1960-61. Observations on the Quaternary of Syria. *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 10-11, pp. 7-69.

MOUTERDE, P., 1970. *Nouvelle flore du Liban et de la Syrie.* Tome 2. Beyrouth.

NAHAL, I., 1962. Contribution à l'étude de la végétation dans le Baer-Bassit et le Djebel Alaouite de Syrie. *Webbia* 16, pp. 477-641.

POST, G.E. & J.E. DINSMORE, 1932. *Flora of Syria, Palestine and Sinai.* 2 vols. Beirut.

SCHAEFFER, Cl.A.-F., 1939. Aperçu de l'histoire d'Ugarit d'après les découvertes faites à Ras Shamra. *Ugaritica* 1, pp. 1-52.

SCHAEFFER, Cl.A.-F., 1962. Les fondements préhistoriques d'Ugarit. *Ugaritica* 4, pp. 151-250.

WAINES, J.G. & N.P. STANLEY PRICE, 1975-77. Plant remains from Khirokitia in Cyprus. *Paléorient* 3, pp. 281-284.

ZEIST, W. VAN, 1979-80. Plant remains from Girikihaciyan, Turkey. *Anatolica* 7, pp. 75-89.

ZEIST, W. VAN, 1981. Plant remains from Cape Andreas-Kastros (Cyprus). Appendice VI in: A. Le Brun, *Un site néolithique précéramique en Chypre: Cap Andreas-Kastros.* Paris, pp. 95-99.

ZEIST, W. VAN & J.A.H. BAKKER-HEERES, 1975. Evidence for linseed cultivation before 6000 bc. *Journal of Archaeological Science* 2, pp. 215-219.

ZEIST, W. VAN & J.A.H. BAKKER-HEERES, 1982(1985). Archaeobotanical studies in the Levant. I. Neolithic sites in the Damascus basin: Aswad, Ghoraifé and Ramad. *Palaeohistoria* 24.

ZEIST, W. VAN & H. BUITENHUIS, 1983. A palaeobotanical study of Neolithic Erbaba, Turkey. *Anatolica* 10, pp. 47-89.

ZOHARY, D. & P. SPIEGEL-ROY, 1975. Beginnings of fruit growing in the Old World. *Science* 187, pp. 319-327.

ZOHARY, M., 1972. *Flora Palaestina.* Vol. 2. Jerusalem.

ZOHARY, M., 1973. *Geobotanical foundations of the Middle East.* 2 vols. Stuttgart-Amsterdam.