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Title**: Plant macrofossils from the site of Tell Arbid, Northeast Syria (3rd–2nd millennium BC). Preliminary report.**

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Keywords: cereals, agriculture, pulses, Tell Arbid, Syria, Ninevite 5

النباتات الأحفورية من موقع تل عربيد شمال شرق سوريا (الألفية الثالثة- الثانية قبل الميلاد) التقرير الأولي

Aldona Mueller-Bieniek, Krystyna Wasylikowa, Anna Smogorzewska

الملخص: الورقة تمثل التقرير الأولي لنتائج التحليل لخمسة عينات من النباتات الأحفورية أتت من سياقات أثرية متنوعة من موقع تل عربيد في شمال شرق سوريا وهذه الحالات تعود أساساً إلى الألفية الثالثة قبل الميلاد (EJV-EJI) مع وجود ضئيل للألفية الثانية (بضاعة الخابور وفترة ميتاني) ومثلت النباتات المزروعة الحبوب والبقوليات تم توثيق زراعة ثلاث أنواع من الحبوب على الأقل تشمل مجموعة من الشعير المقشر ذو الصفين وقمح غني بالبروتينات أو قمح ثنائي الحبة و أنواع من القمح المكشوف وربما قمح المكرونة. الخضراوات تضمنت العدس والبيقة المرة والبازلاء الخضراء وبازلاء الحديقة. النباتات من فترة نينوى الخامسة (EJ I- EJII) وأهميتها في إقتصاد تل عربيد تمت مناقشتها بمزيد من التفصيل نظراً لأكبر عدد من العينات التي قد تم دراستها.

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RESEARCH

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ABBREVIATIONS

AA	*Archäologischer Anzeiger; Jahrbuch des Deutschen Archäologischen Instituts* (Berlin)
ANM	*Archéologie du Nil Moyen* (Lille)
ASAE	*Annales du Service des Antiquités de l'Égypte* (Cairo)
AV	*Archäologische Veröffentlichungen, Deutsches Archäologisches Institut, Abteilung Kairo* (Berlin–Mainz am Rhein)
BAAL	*Bulletin d'archéologie at d'architecture libanaises* (Beirut)
BAH	*Bibliothèque archéologique et historique* (Paris)
BAR IS	*British Archaeology Reports International Series* (Oxford)
BASOR	*Bulletin of the American Schools of Oriental Research* (Ann Arbor, MI)
BCH	*Bulletin de correspondance héllenique* (Paris)
BdE	*Bibliothèque d'étude* (Cairo)
BIFAO	*Bulletin de l'Institut français d'archéologie orientale* (Cairo)
BSAA	*Bulletin de la Société d'archéologie d'Alexandrie* (Cairo)
BSFE	*Bulletin de la Société française d'égyptologie* (Paris)
CCE	*Cahiers de la céramique égyptienne* (Cairo)
EtTrav	*Études et travaux. Travaux du Centre d'archéologie méditerranéenne de l'Académie des sciences polonaise* (Warsaw)
FIFAO	*Fouilles de l'Institut français d'archéologie orientale* (Cairo)
GAMAR	*Gdańsk Archaeological Museum African Reports* (Gdańsk)
GM	*Göttinger Miszellen* (Göttingen)
IAMS	*Institute of Archaeo-Metallurgical Studies* (London)
JARCE	*Journal of the American Research Center in Egypt* (Boston–Princeton–New York–Cairo)
JEA	*Journal of Egyptian Archaeology* (London)
JGS	*Journal of Glass Studies* (Corning, NY)
JJP	*Journal of Juristic Papyrology* (Warsaw)
JRS	*Journal of Roman Studies* (London)
MDAIK	*Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* (Wiesbaden)
OIP	*Oriental Institute Publications* (Chicago)
OLA	*Orientalia lovaniensia analecta* (Louvain)
PAM	*Polish Archaeology in the Mediterranean* (Warsaw)
PSAS	*Proceedings of the Seminar for Arabian Studies* (London)
SAAC	*Studies in Ancient Art and Civilisation* (Kraków)
SAK	*Studien zur altägyptischen Kultur* (Hamburg)
SAOC	*Studies in Ancient Oriental Civilization* (Chicago)
WVDOG	*Wissenschaftliche Veröffentlichungen der deutschen Orient-Gesellschaft* (Berlin–Leipzig)

SYRIA

PLANT MACROFOSSILS FROM THE SITE OF TELL ARBID, NORTHEAST SYRIA (3RD–2ND MILLENNIUM BC). PRELIMINARY REPORT

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Abstract: The paper presents preliminary results of an analysis of 51 samples of plant macrofossils coming from various archaeological contexts from the site of Tell Arbid in Northeast Syria. The contexts were dated mainly to the 3rd millennium BC (EJI–EJV) with a few being of 2nd millennium BC date (Khabur Ware and Mitanni periods). Cultivated plants were represented by cereals and pulses. The cultivation of at least three cereal species is documented, including a hulled variety of two-rowed barley, glumed einkorn and/or emmer wheat, and a species of naked wheat, probably macaroni wheat. Vegetables included lentil, bitter vetch, grass pea, and garden pea. Plants from the Ninevite 5 period (EJI–EJII) and their significance in the Tell Arbid economy are discussed in greater detail owing to the highest number of samples studied.

Keywords: cereals, agriculture, pulses, Tell Arbid, Syria, Ninevite 5

The site of Tell Arbid in northeastern Syria was excavated in 1996–2010 by the Polish–Syrian Archaeological Mission directed by Prof. Piotr Bieliński from the Polish Centre of Mediterranean Archaeology of the University of Warsaw (PCMA) [*Fig. 1*]. The site, which covers approximately 40 ha in area, is composed of the main tell and several smaller hills [*Fig. 2*]. It is of multi-cultural character and includes settlement remains from the Ninevite 5 to the Hellenistic periods. The most extensive development took place in the 3rd millennium BC when Tell Arbid became one of the significant settlements in the upper Khabur area (EJI–EJV in the Syrian Jezirah periodization). The intensive habitation of the site at that time is documented by the discovery of the Ninevite 5 period (EJI–EJII) remains in almost all areas of the site. The site was settled also in the 2nd millennium BC during the Khabur Ware and Mitanni periods as well as in Neo-Babylonian times.

Archaeobotanical samples were collected from different areas of the site, namely Area D (Late Ninevite 5 dwelling quarter located in the northwestern section of the site), Area W (mainly layers of the Ninevite 5 period in the southern section of the site), Areas SS, SR(P), SA, and SD located on the main tell and in the eastern section of the site. The present report describes the results obtained from the preliminary examination of 51 samples from among 82 that were collected during the various excavation seasons. A complete analysis of all samples will be the subject of a separate article.

Samples date from different chronological periods represented on the site. Most of them (34 samples, 67% of all samples) come from layers dated to the Ninevite 5 (VIIC in ***Table 1***) period. The representation of other periods is poorer: EJIII (VIIB) is represented by five samples (including a sample dated to VIIC/VIIB), EJIV (VIIA) by two samples, EJV (VI) by three samples (including two samples dated to V/VI), and Khabur Ware period by four samples. The archaeological contexts from which the samples originated are diverse: different occupational levels (floors, farmyards, streets), fill of rooms, ovens, pits and pots, and features of unspecified character [***Table 1***].

Sampling was done by archaeologists supervising excavations in the individual sectors, most of the time when plant remains, e.g., charred grains, were observable with the "naked eye". These samples were composed only of large plant fragments (over 2 mm), probably picked selectively from the deposit. Samples collected together with the soil in which the fossils were embedded (e.g., ashes from an oven, occupational floor level, oven or pot content) contained, in addition

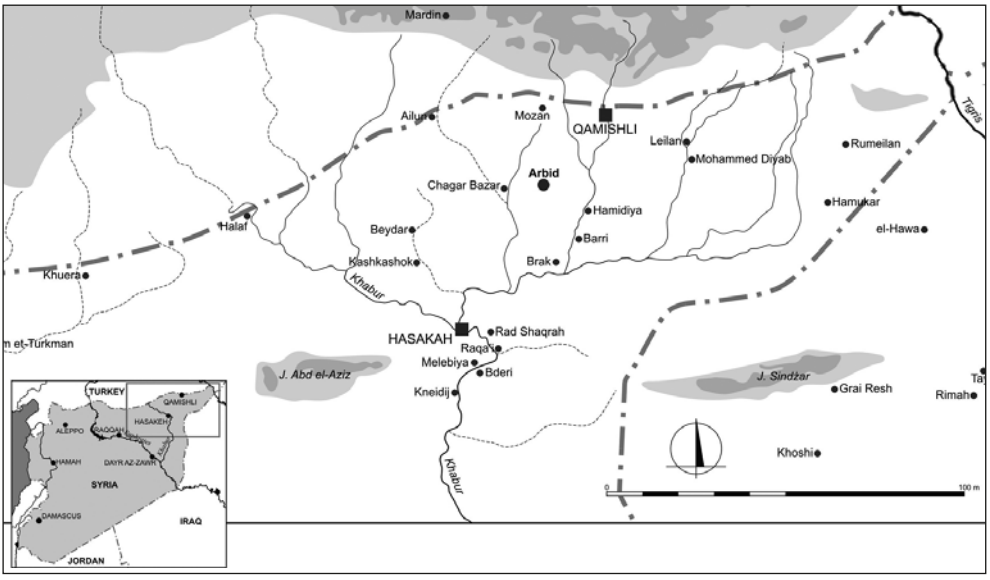

Fig. 1. The Upper Khabur region in Syria showing the location of Tell Arbid (Drawing M. Momot)

to grain, cereal chaff and small seeds of various plants.

In spite of non-systematic sampling, the preliminary results presented in this article have brought valuable information on plant use at Tell Arbid mainly in the Early Bronze Age, from the Ninevite 5 (EJI–EJII) to the EJIV periods. Archaeobotanical analyses were the first for these periods; hitherto only plant remains

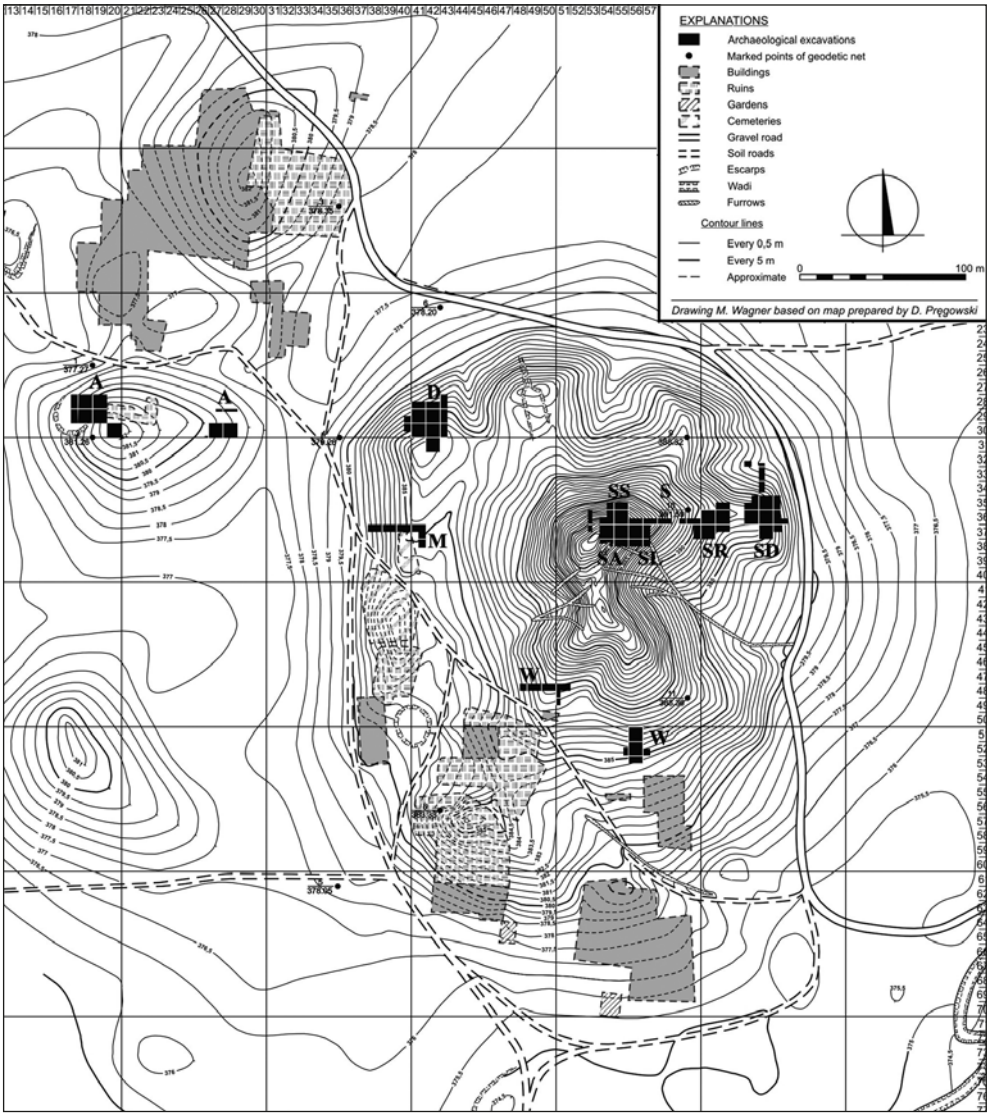

Fig. 2. Topographic map of Tell Arbid showing location of excavated areas (Drawing M. Momot, M. Wagner)

Table 1. List of archaeobotanical samples from Tell Arbid, their localization (Tag), chronology, archaeological context and occurrence of plants (further explanations in the text). Tag – descriptive label of sample, L – locus; chronology: VIIC – Ninevite 5 (EJI–EJII), VIIB – EJIII, VIIA – EJIV; VI – post-Akkadian (EJV), V – Khabur Ware; abundance: + 1–2, ++ 3–49, +++ 50–100, ++++ >100 specimens

No.	Tag	Sample	Context	Chronology	Barley grain	Barley chaff	Wheat grain	Wheat chaff	Cereals undet. grain	Cereals undet. chaff	Pulses cult	Trees & shrubs	*Aegilops*	Wild herbs	Other
1	ARB'08-W-52/55-43s	Charred grains	Floor (subfloor F5) in L25 (farmyard)	VIIC	+		++				+		+		
2	ARB'03-D-30/41-27b	Charred grains	L3 (floor and below)	VIIC							++				
3	ARB'98-S-36/58-58	Charred grains	L12 (floor with hearth)	VIIC	++++		++				+		++		wood charcoal
4	ARB'07-W-52/55-61	Charred grains	Pit L18	VIIC								+			half of an acorn
5	ARB'07-W-52/56-25	Charred grains	Ash layer near wall W10 – farmyard? L11 (NW part)	VIIC	++	+	++						++		
8	ARB'07-W-51/56-34	Charred grains	L7	VIIC	+++		+++				++		++	++	
9	ARB'07-W-51/56	Charred grains		VIIC	++		++		++		+		++		
10	ARB'07-W-52/56-50	Charred grains	Ashes south of wall W22	VIIC	+++		+++		++				++		8 coprolites, wood charcoal
20	ARB'07-W-51/56-96b	Charred grains		VIIC	++		++								
22	ARB'07-W-51/56-89a	Charred grains		VIIC	++		++		+		+		++		wood charcoal
24	ARB'07-W-51/56-107b	Charred grains	L23	VIIC	++		++							+	
25	ARB'07-D-30/40-H	Ashes	Hearth	VIIC			++	++++	+					+	burgul?
26	ARB'07-D-30/41-30b	Charred grains	L45	VIIC	+	++	++	++	+						*Fabaceae* leaves (very numerous), thorns, fragments of charred coprolite?

No.	Tag	Sample	Context	Chronology	Barley grain	Barley chaff	Wheat grain	Wheat chaff	Cereals under. grain	Cereals under. chaff	Pulses cult	Trees & shrubs	*Aegilops*	Wild herbs	Other
27	ARB'06-D-30/41-III		Farmyard	VIIC				++++	++			+			
28	ARB'06-D-30/41-L8		L8	VIIC		+		++	++						
32	ARB'09-W-53/56-20	Charred grains		VIIC	++		++				+				twig fragments, wood charcoal
35	ARB'08-W-52/56-33	Charred grains	L15, NE quarter – fill approx. 5 cm above floor	VIIC	++		++				++		+		wood charcoal
45	ARB'03-D-29/42-3a		Content of granary (L5)	VIIC		++	+		++		+		+	+	twig fragments, leaves and thorn, wood charcoal
46	ARB'03-D-30/41-17a		L7	VIIC	+		+	+++	++			+		++	twig fragments, thorns, wood charcoal
47	ARB-D-30/41-P		Farmyard, lowest level with ashes	VIIC	++	++	++	++	++	++	++			++	
48	ARB'06-D-30/41-I		Farmyard	VIIC			+	++	++	+	++		++	++	
49	ARB'06-D-30/41-II		Farmyard	VIIC				++	++	++				+	thorn, 2 embryos of grains
50	ARB-D-30/41-L6		L6, fill of oven	VIIC				++	++					+	twig fragments
51	ARB-D-30/41-L6B/A		L6B (usage level with oven)	VIIC		+		+	+						grass? stem node
52	ARB-D-30/42-L33		L33 (farmyard, passage)	VIIC		+		++		+				+	thorn
53	ARB'07-D-30/41-56a		L42 (2nd floor)	VIIC	+			+	+		++		+		
54	ARB'03-D-29/42-2b		Content of granary (L5)	VIIC		+		++				+		++	leaf fragments, twig and 4 thorns

No.	Tag	Sample	Context	Chronology	Barley grain	Barley chaff	Wheat grain	Wheat chaff	Cereals undet. grain	Cereals undet. chaff	Pulses cult	Trees & shrubs	*Aegilops*	Wild herbs	Other
55	ARB-D-30/40-ulica		West street	VIIC		++	+	++	++					+	thorns, vegetative parts, twig/stem fragments, parenchyma? fragm.
56	ARB-D-ulica		Main street	VIIC				++	++		+		+	++	indeterminate diaspores well preserved (4 types), buds?; thorns, recent insect
57	ARB'06-D-30/41-IV		Farmyard	VIIC					+			+		++	numerous twig/stem fragments, thorns, *Fabaceae* leaves, leaf fragm.
58	ARB'06-D-30/41-V		Farmyard	VIIC		+	++	++	+				+	+	thorn, twig fragments, wood charcoal
72	ARB'08-W-52/55-36s		Farmyard L31 (subfloor F12)	VIIC	++	+	+	++	++				++	++	twig/stem fragments, parenchyma fragm.
75	ARB'08-W-52/56-25b		Hearth - L25 – part SE	VIIC	++	++	++	+++	+	+			++	++	twig fragments, charred corn pulp?; wood charcoal
78	ARB'08-W-52/56-25a		Hearth - L25 – part SW	VIIC		+		++	+	++			+	+	badly preserved in general
34	ARB'09-W-53/57-28	Charred grains	W part of excavation	VIIC/ VIIB	++++										
29	ARB'08-SS-37/57-2	Charred grains	Floor level F1	VIIB	++										bones, daub
31	ARB'08-SS-36/56-28a	Charred grains	L35 (fill)	VIIB	++		++								
42	ARB'08-SS-37/57-2	Charred grains	Floor level F1	VIIB	++		++								
71	ARB'08-SS-36/56-34a		L35	VIIB	++	++	++	+++	++	++			++	+++	culm nodes, twigs/stems, coprolites?
12	ARB'99-SD-37/65-145	Charred grains	L18 (floor)	VIIA	+++		++		++						wood charcoal

No.	Tag	Sample	Context	Chronology	Barley grain	Barley chaff	Wheat grain	Wheat chaff	Cereals undet. grain	Cereals undet. chaff	Pulses cult	Trees & shrubs	*Aegilops*	Wild herbs	Other
18	ARB'99-SS-37/56-17	Charred grains		VIIA	++		+		++					+	culm fragments, roots?, wild herbs – only grass grain, wood charcoal
11	ARB'00-SS-36/55-36	Charred grains		VI											charred coprolites (8) – sheep/goat droppings?
16	ARB'01-SR-37/60-73	Charred grains	Pit in L10	V/VI	+++		+								
17	ARB'01-SR-37/60-80	Charred grains	L15	V/VI	++++		++				++		++	++	wood charcoal
7	ARB'99-SR-36/61-60	Charred grains	L6	V	++		+		+				+		twig fragments, parenchyma?
13	ARB'03-SD-36/64-71	Charred grains	L9	V	++		+						+		
14	ARB'99-SA-37/54-54a	Charred grains	Ash layer in center of quarter (pit L16?)	V	++++		++++		++++		++		++	+	fragments of bones, others, wood charcoal
15	ARB'99-SA-37/54-46	Charred grains	Storage pit (L15) with clay lining at the bottom	V	+++		++		++		+				stones, pottery, bones, tooth, 2 fragments of charred coprolite?, wood charcoal
19	ARB'03-W-56/51-51	Charred grains	Level in southern part of a quarter (below ashes)	?	++		++								
21	ARB'03-SD-36/64-124	Charred grains	Occupational level in SE quarter	?	++		++								
23	ARB'03-W-56/52-46	Charred grains	Ash layer below W2	?	++		++		++		+				wood charcoal

from younger periods (post-Akkadian and Middle Bronze Age) have been described (Wasylikowa and Koliński 2013).

Archaeobotanical analyses were carried out in the Palaeobotany Department of the Władysław Szafer Institute of Botany, Polish Academy of Sciences in Kraków. In the laboratory sample volume was measured and then samples were dry sieved using 0.5 mm mesh sieves. A few samples (Nos 25, 28, 46, 49, 52, 58) were wet-sieved using the same size of sieve mesh. Samples described as "charred grain" were not sieved but directly sorted in dry condition. Low-power stereomicroscope with 6–30 magnification was used for the segregation and identification of plant remains.

RESULTS

All plant remains were charred. The results of their identification are presented in three tables. ***Table 1*** gives sample localization, field description, archaeological context and chronology followed by simplified sample content. All wheat species were put together, cereal chaff and grains were shown separately, cultivated pulses included all taxa specified in ***Table 2***; separate columns present trees and shrubs, *Aegilops* cf. *crassa*, all wild herbaceous plants (specified in ***Table 3***) and the information about the occurrence of wood charcoal and other remnants (leaves, spines, coprolites etc.). All identified plant taxa listed according to chronological periods are shown in ***Table 3***.

Cultivated plants were represented by cereals and pulses. Cereals included hulled two-rowed barley (*Hordeum distichon* L.), glumed wheat, einkorn and/or emmer (*Triticum monococcum* L./ *T. dicoccon* Schrank.), and naked macaroni wheat (*T. durum* Desf.) [***Fig. 3:5, 6***]. Barley was preserved mainly as grains with traces of palaea and lemma; ear fragments permitting species identification were less abundant [***Fig. 4:1–3***]. The remnants of glumed wheats included grains and more numerous glume fragments and spikelet bases (chaff) [***Fig. 3:1–4***]. The occurrence of macaroni wheat was documented by two fragments of ear rachis found in one sample from the Ninevite 5 period (sample 26). The distinction of naked *T. durum* grains from those of bread wheat *T. aestivum* L. is not possible, but most probably naked wheat grains which were present in one sample from the Ninevite 5 period (one grain) and in one sample dated to the Khabur Ware period (about 170 grains) belonged to macaroni wheat. Some grains could be classified only as wheat (*Triticum* sp.), some could not be determined even to the genus level (Cerealia indet.). In the whole material barley and all wheats treated together occurred with the same frequency (barley in 43 and wheat in 42 samples) but barley remains prevailed quantitatively. The Ninevite 5 period differed from the average by having more frequent wheat (31 samples) than barley (25 samples).

Seeds of pulses belonged to four species, lentil *Lens culinaris* Medic., bitter vetch *Vicia ervilia* (L.) Willd., grass pea *Lathyrus* cf. *sativus* L., and garden pea *Pisum* cf. *sativum* L.; a few seeds remained undetermined. Pulses occured in small numbers and in a few samples, most frequently in samples from the best studied Ninevite 5. A few seeds of *Vicia ervilia* occurred in two samples from the

Table 2. List of pulses from Tell Arbid; given number of seeds (legend as in Table 1)

No.	Tag	Chronology	*Lathyrus* cf. *sativus*	*Lathyrus* sp.	*Lathyrus*?	*Lathyrus* sp./*Vicia ervilia*	*Vicia ervilia*	*Vicia ervilia*?	*Pisum* sp.	*Pisum sativum*	*Lens culinaris*	Pulses large indet.
1	ARB'08-W-52/55-43s	VIIC				1						
2	ARB'03-D-30/41-27b	VIIC		20								
3	ARB'98-S-36/58-58	VIIC			1		1					
8	ARB'07-W-51/56-34	VIIC		4			1				2	
9	ARB'07-W-51/56	VIIC									1	
22	ARB'07-W-51/56-89a	VIIC									1	
32	ARB'09-W-53/56-20	VIIC		1								
35	ARB'08-W-52/56-33	VIIC		1					1			1
45	ARB'03-D-29/42-3a	VIIC										1
47	ARB-D-30/41-P	VIIC		1					1			1
48	ARB'06-D-30/41-I	VIIC		2							1	
53	ARB'07-D-30/41-56a	VIIC							1		2	
56	ARB-D-ulica	VIIC							1			
17	ARB'01-SR-37/60-80	V/VI									5	4
14	ARB'99-SA-37/54-54a	V	2				18	4				
15	ARB'99-SA-37/54-46	V								7		1
23	ARB'03-W-56/52-46	?		1								

Table 3. List of plants identified in all samples from Tell Arbid and their estimated abundance in individual periods (legend as in Table 1)

Period	Ninevite 5 (EJI–EJII)		EJIII	EJIV	Post-Akkadian (EJV)		Khabur Ware	
Years BC	2700–2550		2550–2340	2340–2150	2150–2000		2000–1500	
Chronology	VIIC	VIIC/B	VIIB	VIIA	VI	VI/V	V	?
Number of samples	34	1	4	2	1	2	4	3
CEREALS								
Hordeum distichon	++++	++++	++++	+++	++++	++++	++++	++
Triticum dicoccon/monococcum	++++		+++					++
Triticum durum/aestivum	+						++++	
Triticum cf. *durum*	++							
Triticum sp.	++++		++	++		++	++	++
Cerealia indet.	+++		++	++			++++	++
LEGUMES								
Lathyrus cf. *sativus*							+	
Lathyrus sp.	++							+
Lathyrus?	+							
Lathyrus/Vicia ervilia	+							
Lens culinaris	++					++		
Pisum sp.	++							
Pisum cf. *sativum*							++	
Pulses large indet.	++					++	+	
Vicia ervilia	+						++	
Vicia ervilia?							++	
TREES and SHRUBS								
Capparis sp.?	+							
Quercus sp.	+							
Prosopis farcta	+							
WILD HERBS								
Aegilops cf. *crassa*	+++		++			++	++	
Apiaceae (*Ammi* type?)	++							
Apiaceae (*Pimpinella* type)	+							
Asteraceae	+							
Astragalus/Trigonella			++					
Coronilla cf. *scorpioides*			++					
Coronilla sp.	+		++					
Galium large cf.	++		++			+		
Galium small	++							
Heliotropium type	+							
Hordeum cf. *spontaneum*				+				
Poaceae indet.	++		++	+		++	+	
Silene type	+							
Teucrium type	+							
Torilis type	+							
Vaccaria sp.			+					
Verbascum sp.	+							

Fig. 3. Charred plant macroremains from the site of Tell Arbid: 1–4 – Triticum sp. (glumed), 1 – grains from sample 12, 2 – grains from sample 17, 3 – chaff from sample 71, 4 – chaff from sample 27; 5–6 – Triticum sp. (naked), grains from sample 14 from dorsal and ventral side. Scale bars equal 1 mm (Photos A. Mueller-Bieniek; processing K. Cywa)

Fig. 4. Charred plant macroremains from the site of Tell Arbid: 1–3 – Hordeum distichon (glumed), 1 – grains from sample 12, 2 – grains from sample 17, 3 – rachis internodes (chaff) from sample 71; 4 – Prosopis farcta from sample 46; 5–6 – Aegilops cf. crassa, 5 – spikelet from both sides with two grains inside, from sample 8, 6 – grains from sample 3; 7 – Vaccaria sp. from sample 71; 8 – Silene sp. from sample 46; 9 – Heliotropium type from sample 57. Scale bars equal 1 mm (Photos A. Mueller-Bieniek; processing K. Cywa)

Ninevite 5 period and more abundantly in one sample of ash from the Khabur Ware period. Single seeds of *Lens culinaris* and *Pisum* cf. *sativum* appeared in a few samples from the Ninevite 5 period, lentil in one sample from Period VI/V (EJV/Khabur Ware), and pea in a storage pit from the Khabur Ware period. *Lathyrus* sp. seeds were found in features from the Ninevite 5 period, usually in small numbers, only in sample 2 from the floor of a room were they more abundant and represented the only kind of remnants present in this sample.

Wild herbaceous plants were dominated by grasses (Poaceae), among which the remnants of Persian goatgrass (*Aegilops* cf. *crassa* Boiss.) prevailed [***Fig. 4:5, 6***]. This grass has large grains and spikelets, close to cereal grains in size, and difficult to separate from cereals during threshing and winnowing. Caryopses and spikelets of this grass were found in samples from Ninevite 5, EJIII, and Khabur Ware periods. In greater number they occurred in two samples from the Ninevite 5 period (samples 3 and 8) and in one sample from Khabur Ware period (sample 14), in all cases together with charred barley and wheat grains. Large participation of grain and chaff of different *Aegilops* species among cereal grains from Syrian archaeological sites was emphasized by some archaeobotanists. Wetterstrom (2003) suggested that this grass could be tolerated by ancient farmers as a supplement of poor crops. This would be an interpretation analogous to that sometimes accepted for the presence of *Bromus* grains in European material. The genus *Aegilops* was subject of many studies carried out in connection with its role in the origin of hexaploid wheats (Zohary, Hopf, and Weiss 2012). Its use as animal fodder was also discussed. Smith (2012) wrote that "...the idea that it was intentionally grown and used for human consumption needs to be explored more fully". Small-grained grasses were frequent in Tell Arbid in addition to goatgrass. Grass culm fragments occurred in several samples beside grain. Among wild plants, small-seeded taxa from Fabaceae family, namely *Coronilla* cf. *scorpioides* (L.) Koch. and *Astragalus/Trigonella* were second in abundance. Their seeds are numerous in one sample (sample 7) from the EJIII period. A few seeds of *Coronilla* occurred in several samples from the Ninevite 5 period. Relatively numerous are large fruits of an undetermined *Galium* species; diaspores of other taxa appear as single specimens. Trees are represented by one oak (*Quercus* sp.) acorn and possibly one caper *Capparis* sp. seed, and shrubs by seeds of Syrian mesquite (*Prosopis farcta* (Banks. & Sol.) Macbride) [***Fig. 4:4***], all found in samples from the Ninevite 5 period. Undetermined remains include a few seeds/fruits, numerous small twigs, leaves, spines, and parenchyma fragments.

CONCLUSIONS

The incomplete identification of plant material and various volumes of deposits examined from individual levels (34 samples from the Ninevite 5 period and 1–4 from the other periods) caused that only very preliminary conclusions could be drawn about the significance of cultivated plant species in the economy of Tell Arbid and the role they played in different settlement periods. In addition,

sampling procedures that favored cereal grains and seeds of cultivated pulses and eliminated smaller specimens made difficult (or impossible) the reconstruction of economic activities from sample composition (more on the influence of the sampling procedure on sample composition in Wasylikowa and Koliński 2013). For instance, among the samples of "charred grain" according to the field description, only two (25 and 26) contained also chaff remains [***Table 1***]. Did the absence of chaff in other "charred grain" samples result from sampling procedure or did they contain pure grain intended for consumption? No answer can be given to such questions. Keeping these reservations in mind, we have attempted, however, to present some general conclusions to be verified in future studies.

ROLE OF PLANTS IN THE ECONOMY OF TELL ARBID

The cultivation of at least three cereal species is documented, including the hulled variety of two-rowed barley, glumed einkorn and/or emmer wheat, and a species of naked wheat, probably macaroni wheat. Vegetables included lentil, bitter vetch, grass pea, and garden pea. *Coronilla* cf. *scorpioides*, *Hordeum* cf. *spontaneum*, species from the genera *Astragalus/Trigonella, Galium, Silene, Teucrium, Vaccaria* and various grasses were field weeds and grew in the steppe and in places used for grazing domestic animals [***Fig. 4:7, 8***]. Their seeds and fruits could be brought to the settlement together with cereals and with animal droppings or dung used for fuel. Dung was probably the source of Syrian mesquite *Prosopis farcta* seeds. Nowadays, this shrub is an invasive field weed, but it produces fruits after harvest time and its main habitats are disturbed places, fallow, sandy plains, canal banks and road sides. *Prosopis* pods have a fairly high content of sugar and are eaten by sheep, goats, and cattle, young plants are also grazed but the old ones, lignified, can be eaten only by camels (Qasem 2007; Charles and Bogaard 2001; Colledge 2003). It is assumed that in Iraq this plant has positive influence on barley cultivation due to its ability to prevent soil salinity and maintaining its porosity. It is also favored as bee fodder and in desert areas as animal fodder; it may also prevent soil erosion (Hanelt 2001).

At Tell Arbid barley was an important crop during the whole Early Bronze Age because it occurred abundantly in samples from all periods [see ***Table 3***]. A similar situation was observed in area P of this site (Wasylikowa and Koliński 2013). As far as glumed wheats were concerned, they were found in the present material only in samples from the Ninevite 5 and EJIII periods, but their absence in the younger levels may be the result of smaller material examined, because in area P they were recovered from post-Akkadian and Middle Bronze Age levels (Wasylikowa and Koliński 2013). Naked wheats were rare, the occurrence of grains in one sample from the Khabur Ware period [***Table 3***] corresponds to the slight increase of their participation in the Middle Bronze Age samples from area P. In the presently studied material, the Ninevite 5 period differed from younger ones by a higher frequency of chaff remnants which appeared in 64% of samples (21 out of 33 examined), emmer/einkorn glumes and spikelet forks being more frequent (in 56% of samples) than barley ear rachis fragments (in 39% of samples). The archaeological context

of these samples was described most often as a farmyard (seven cases), seldom as the content of a granary, fireplace, oven fill, floor or room [see ***Table 1***]. Presence or absence of chaff in individual features could suggest their use for different purposes, provided that sampling was comparable.

In samples from the Early Jezirah III period (Period VIIB in ***Table 1***) no macaroni wheat was found. The richest sample 71, in addition to the fairly large number of barley grains and ear rachis fragments, numerous chaff fragments of hulled wheats, and undetermined cereal grains, contained seeds or fruits of six taxa of wild plants. This was the only sample in which seeds of *Coronilla* cf. *scorpioides* and *Astragalus/Trigonella* type were very abundant. *C. scorpioides* belongs to field weeds but in the 16th–17th centuries it was also cultivated in gardens as a medicinal plant. Nowadays it is used in folk medicine and as a dye plant (Hanelt 2001). Two samples from the Akkadian period (EJIV) contained only barley and wheat grains and two taxa of wild herbaceous plants. In the sample from the post-Akkadian period only barley grains occurred.

Slightly richer material originated from the Khabur Ware period. In addition to cereals, barley and naked wheat (probably macaroni wheat), also three species of pulses appeared, namely grass pea, bitter vetch, and garden pea. No hulled wheats were found. Wild plants were represented only by grains and spikelet fragments of Persian goatgrass.

PLANTS IN SELECTED ARCHAEOLOGICAL CONTEXTS

The utilitarian properties of archaeological contexts could not always be confirmed by the composition of the plant material preserved in these contexts. Samples 52 and 54, which contained small amounts of chaff but no cereal grains, probably represented refuse from threshing. A small number of specimens and their poor preservation may indirectly suggest their origin from places intensively used, swept, and trodden. Such an interpretation agrees with the type of context from which sample 52 derives. It was an open space for communication purposes probably (which implied intensive traffic) and used for other household activities that were confirmed by the discovery of ovens connected with food preparation. The case of sample 54 is different. This sample came from a granary, which was filled with a homogenous light grey ash-like substance that might be the remains of decomposed organic material (cereal?, fodder?) stored in the place. The plant assemblage from this sample provided no information as to the kind of food stored in this granary. Sample 45, which was also poor in plant remains, came from the same granary.

A storage pit from the Khabur Ware period (sample 15) with clay-lined bottom contained five wheat grains, 72 barley grains and probably garden pea. It could have been used for storage of agricultural products, but it must be emphasized that much greater quantities of cereal grains were found in samples coming from the other contexts, for instance, from floors of rooms (samples 3, 8, 17). Samples taken from hearths (samples 25, 75, 78) contained grains and chaff which may have originated from fuel (animal dung, threshing refuse) or represented remains of parching grain. Parching was used to facilitate dehusking of glumed wheats (Hillman 1984: 129), but it is not clear whether hulled barley was parched.

Zohary, Hopf, and Weiss (2012: 52) write: "In traditional farming communities, naked barleys were frequently favoured for the preparation of food, whereas hulled forms were preferred for brewing beer and for animal feed" and in such cases hulled barley grains were not parched. Partly hulled barley grains are now recommended as healthy food and perhaps in older times they were eaten by humans. In addition, parching (also of naked grain, for instance, of wheat or rice) could as well be used for improving meal taste or speed up cooking. As a rule, however, hulled cereals, mainly wheat, were more often subject to charring compared to naked forms. The hearth from which sample 25 was collected could be used for parching wheat, because it contained only remains of glumed wheat. Numerous fire installations found in the Ninevite 5 period were possibly connected with parching grain. Sample 3 described as "charred grain" was taken from the surface of a hearth and a pot sunk into the hearth in a room dated to the Ninevite 5 period. In addition to cereals, goatgrass, and pulses, it contained also fairly numerous pieces of wood charcoal, so this assemblage possibly represented the remains of a fire, hearth, or burnt wastes.

Cereal grains and threshing waste, wild grasses, pulses, trees and shrubs and other remains occurred in contexts identified as farmyards (samples 27, 47, 48, 49, 58, 72). The variety of the material may reflect different activities carried out in such places, for instance, meal preparation, processing of food products, storage of unclean cereals or fodder. Evidently waste of various origin accumulated in the farmyards. Samples 50 and 51, taken from an oven used for baking bread (Arabic *tannur*), contained very few plant remains (barley and wheat, twigs, a grass culm) which could come from fuel or food. This oven was discovered in a kitchen-type room that had two ovens probably used for baking bread and cooking. Other objects found in this room included animal bones representing food leftovers, cooking pots, and a stone pestle which could have been used for grinding cereal grain.

REMARKS ABOUT AGRICULTURE OF THE NINEVITE 5 PERIOD

Several Bronze Age sites from northern Syria provided abundant plant material dated to the same periods as those discussed in the present paper. These are Tell Leilan (Wetterstrom 2003; Smith 2012), Tell Brak (Colledge 2003; Charles and Bogaard 2001; Hald 2001), Tell Mozan (Riehl 2010), Tell Hamman el-Turkman (van Zeist 2003), Tell Hadidi (van Zeist and Bakker-Heeres 1985), Tell es-Sweyhat (van Zeist and Bakker-Heeres 1985), Tell Raqa'i (van Zeist 2001), and Tell Bderi (van Zeist 2001; 2003). The Ninevite 5 period, which is best represented in our material, was described only from three sites, namely Tell Brak, Tell Leilan, and Tell Raqa'i. In all of them the set of cultivated plants was similar. In Tell Leilan two species of wheat were cultivated (emmer and macaroni wheat) and hulled two-rowed barley (Wetterstrom 2003: 387). Proportions between wheat and barley varied in individual levels, but showed no unidirectional trend, because both in the Early Ninevite 5 Leilan IIIa and Late Ninevite 5 Leilan IIId, stratum 15f–d, wheat prevailed over barley (Wetterstrom 2003: Table 2). Cereals grown in Tell Brak included hulled barley (no information on whether two- or many-rowed), emmer and einkorn wheats and a species of naked wheat (Colledge 2003: Tables

11.3, 11.4). Barley and wheat occurred with the same frequency suggesting their equal significance in cultivation. Cereal composition in Tell Raqa'i (levels 2 and 3) differed from the other localities in the presence of naked two-rowed barley, which was the predominant cereal. Next was hulled wheat, emmer more abundant that einkorn; naked wheat (macaroni or bread wheat) played a subordinate role. The group of pulses included lentil, garden pea, bitter vetch, grass peas and chickpea (*Cicer arietinum*) and was similar in all sites in taxonomic composition, with some differences in quantitative relations between individual species. Pulses supplemented the diet of Near Eastern societies in protein and were probably used also as soil enriching plants and as animal fodder (Charles 1985: 40).

Tell Arbid is situated in a zone of rain-fed agriculture which requires no irrigation but due to the highly variable rainfall and often occurring dry years is more risky in comparison with the agriculture of southern Mesopotamia based on irrigation (Weiss 1986). Barley and wheat have different requirements with respect of soil and moisture. Barley, compared to wheat, is more resistant to drought and soil salinity, which was a serious problem in irrigation-based agriculture in southern Mesopotamia. The cultivation of two–three wheat species and barley in Tell Arbid in the Ninevite 5 period could have been a special farming strategy intended to minimize the risk of crop loss by sowing cereals with different soil and climatic requirements.

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