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Palaeoethnobotanical Data from the High Mountainous Early Bronze Age Settlement of Tsaghkasar-1 (Mt. Aragats, Armenia)

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Abstract: *Palaeoethnobotanical investigations suggest that at least part of the Early Bronze Age population of Tsaghkasar was settled and practiced agriculture in the high mountainous zone. People there appear to have cultivated hexa- and tetraploid wheats (probably bread wheat and emmer) and barley (possibly hulled). Bronze Age agriculture in the Southern Caucasus differs from earlier and later period when cultivation of pulses, oil-producing plants, and other plants was common. This emphasis on the cultivation and use of certain cereal grains at Early Bronze sites such as Tsaghkasar can tentatively be added to a constellation of practices associated with the Kura-Araxes culture in the South Caucasus.*

Key Words: palaeoethnobotany, mountainous, Bronze Age, South Caucasus

Introduction

The high elevation Early Bronze Age (EBA) settlement of Tsaghkasar-1 was situated on the slopes of Mt. Tsaghkasar (a peak on the western flank of the massif of Aragats), at an altitude of 2080 meters above sea level (N 40º 28' 31", E 43º 55' 42"). The settlement belonged to the Kura-Araxes culture and dated to the last quarter of the 4th millennium BC. The settlement is comparably large, consisting of stone built structures occupying more than 10 hectares (Avetisyan 2009).

Several storage pits and many agriculture-related tools, e.g. obsidian sickles, a bronze sickle, grinding stones, hand stones, have been excavated at the Tsaghkasar-1 Early Bronze Age settlement. The discovery of tools for harvesting and processing cereals in conjunction with storage pits supports supposition regarding the practice of local agriculture in the high mountainous zone of Tsaghkasar during the Early Bronze Age.

This paper summarizes the results of a study with the primary aim of investigating the plant economy of the Early Bronze Age population of Tsaghkasar-1 settlement in the context of the vegetation cover of the settlement's microregion. This investigation represents a new and significant synthesis of archaeobotanical and excavation methodologies in the exploration of Early Bronze Age agriculture in the Mount Aragats region.

Materials and Methods

Strategic sampling of archaeological sediments was undertaken to target archaeological contexts where deposition and preservation of plant remains was most probable. Soil samples were collected from internal and external parts of buildings (in close association with walls) and from the soil contents of pits. Eight (8) soil samples with a total volume of 510 liters were recovered and processed during the 2005 and 2008 excavation seasons. Volumes of samples ranged from 10 to 60 liters, and averaged 30 liters. Processing of samples was done in two stages to isolate as many ancient plant remains as possible. First, the samples were floated (0.25 mm mesh) to separate light fraction; most of the charred remains and some mineralized materials were recovered in this fraction. After flotation the heavy fraction was wet-sieved (1 mm mesh); rare charred specimens and the essential part of the mineralized remains were recovered in this fraction.

The state of preservation of plant remains is relatively low at Tsaghkasar-1; more than 136 carbonized or mineralized carpological specimens were recovered (the quantity of fragments of charred cereal grains are measured in milliliters (~2.7 ml) and are not included in the 136 units or in calculations of density; Supplementary Table). The density of carpological material ranges from 0 (i.e. empty samples) to 1.7 units per 1 liter sediment, with the average result being 0.17

Figure 1. Location of the Early Bronze Age Tsaghkasar-1 settlement (Mt. Aragats, Armenia) and pits excavated at the site.

units/liter (Supplementary Table). To supply a modern reference dataset for identification of the archaeobotanical materials, living cultivated and weedy plants were also collected from the vicinity of the Tsaghkasar-1 site.

Results and Discussion

The majority of the Tsaghkasar-1 carpological material comes from two excavated pit features (UF31 & UF38; Figures 1 and 2; Supplementary Table). Pit UF31 was approximately 2.0 m deep and pit UF38 was 1.5 m deep. Relatively high concentration of carpological materials in soil from the lower parts of pits (Supplementary Table) suggests that archaeobotanical materials were *in situ* at those levels. Meanwhile, poorly preserved archaeobotanical material retrieved from other contexts, such as internal and external sides of buildings, suggests incidental deposition of material in these locations.

Identifiable cereal grains and other parts of the cereal spike are the only examples of cultivated plants at the site and consist of 56% of the identifiable carpological materials. In addition, there are also hundreds of unidentifiable fragments of cereal grains, with a total volume of 2.7 ml that could not be identified to the genus level (Supplementary Table). The cereal grains and grain fragments are charred and are preserved well enough to be identified as cultivated wheat (*Triticum*) and barley (*Hordeum*; Poaceae).

Distinguishing between tetra- and hexaploid species of wheat based on charred grains is problematic, especially due to several kinds of distortions and deformations that result from charring. Charred wheat grains found in the Tsaghkasar-1 Early Bronze Age settlement belonged to tetra- or hexaploid species, although their morphology is closer to bread wheat, *Triticum* cf. *aestivum* s.l. (Figure 2, 1-4). The remains of other parts of the wheat spike (e.g. rachis internodes and spikelet bases) are more informative and helpful for identification. The presence of naked (free-threshing) tetra- or hexaploid wheat (*Triticum aestivum/turgidum*) is confirmed by the remains of rachis internodes (Supplementary Table). Several remains of spikelet bases suggest the presence of hulled wheat(s) (*Triticum* sp.1; Figure 2, 6). It is possible that the spikelet bases grouped under *Triticum* sp.1 belong to emmer (*Triticum turgidum* L. subsp. *dicoccum* (Schrank ex Schübl.) Thell. = *Triticum dicoccum* Schrank ex Schübler). One well-preserved specimen of a hexaploid wheat rachis internode confirms the presence of *Triticum aestivum* s.l. (Figure 2, 5). At least some (comparably well-preserved examples) of the identified cultivated barley (*Hordeum vulgare* L.; Figure 2, 7-8) grains belong to a hulled variety (or varieties).

All samples from the Tsaghkasar-1 site contain charcoal fragments and coprolites of small rodents, which are indirect indicators of large-scale grain storage (Willcox et al. 2007). The presence of cereal chaff remains from storage pits may serve as additional evidence of local agriculture. The presence of hulled barley and bread wheat in the archaeological samples is also interesting from a diachronic ecological perspective; present populations of the modern Tsaghkasar village and neighboring settlements at equivalent altitude (approx. 2000 m a.s.l.) cultivate hulled barley and bread wheat.

Published and available palaeoethnobotanical data from Early Bronze Age archaeological sites in Armenia and parts of the Southern Caucasus (Lisitsina & Prishchepenko 1977; Hovsepyan 2009b; Wasylikowa et al. 1991) suggest that two-rowed and six-rowed hulled barleys, common and club bread wheats, and emmer were the main field-crops cultivated in the region. This

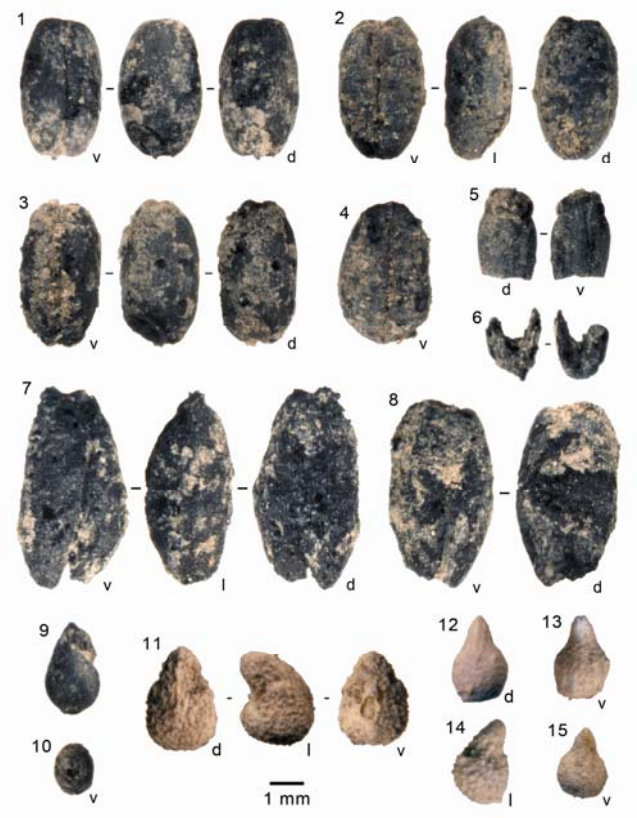

Figure 2. Carpological remains from the Early Bronze Age settlement of Tsaghkasar-1 (Mt. Aragats, Armenia). 1-4 – *Triticum* cf. *aestivum*, charred kernels; 5 - *Triticum aestivum* s.l., charred rachis internode; 6 - *Triticum sp.1* (hulled), charred spikelet fork; 7-8 - *Hordeum vulgare*, charred kernels, 9 - *Polygonum sp.*, charred nutlet; 10 - *Galium sp.*, charred half mericarp; 11 - *Alkanna orientalis*, biomineralized erema; 12-15 - *Buglossoides arvensis*, biomineralized eremas. ***Notes:*** v - ventral side, l - lateral side, d - dorsal side.

pattern continued in the Middle and Late Bronze Ages and the Early Iron Age (the period from the second half of the 4th to the beginning of the 1st millennium cal. BC), while in earlier (Neolithic and Chalcolithic) and later (Middle Iron Age and after) periods pulses, oil-producing plants and other field-crops (e.g. millets for Iron Age) also were common (Hovsepyan 2010b). The specialized agriculture during the Early Bronze Age in the Southern Caucasus may have been influenced by the agricultural traditions of the pre- and early Kura-Araxes culture. It is likely that these groups lived in high montane territories and practiced specialized cereal cultivation to-some-degree influenced by severe natural conditions. During the subsequent expansion of the Kura-Araxes culture, agricultural traditions spread in tandem with material culture to conquered populations. This reconstruction is derived from many ethnographic examples in which strategically situated groups continue their traditional practices and oblige local populations to assimilate their own traditions (including agriculture) in new territories.

Weedy plants recovered from Tsaghkasar-1 site are common in the modern flora of the study area and from prehistoric sites in Armenia (Supplementary Table; Hovsepyan 2009b). For example, the biomineralized erems of *Buglossiodes arvensis* (Boraginaceae; Supplementary Table; Fig. 2, 12-15) are present in practically all archaeological sites in Armenia. On the other hand, a single biomineralized nutlet of *Alkanna orientalis* (Fig. 2, 11; Boraginaceae) at Tsaghkasar-1 is the only archaeobotanical find of this genus in the territory of Armenia (though it still grows at the site). Species of *Rumex*, *Polygonum* (Polygonaceae), Poaceae, Fabaceae (wild taxa), *Galium* (Rubiaceae), *Chenopodium* (Chenopodiaceae), *Scleranthus* (Caryophyllaceae), Cyperaceae, Malvaceae, the seeds of which were recovered in a charred state (*Polygonum*: Fig. 2, 9; *Galium*: Fig. 2, 10), also are still growing near the site. The discovery of *Scleranthus* cf. *annuus* (Caryophyllaceae) fruit at Tsaghkasar-1 is remarkable, as it is rare in the archaeobotanical record. Despite its rarity; palaeobotanical finds of *S. annuus* were also recorded from a high mountain peat-bog (near Geghadzor, 2300 m a.s.l.) on the northern slope of Mt. Aragats (Hovsepyan and Gabrielyan 2002). *Scleranthus* was also recorded (some charred fruits were found) from the Early and Late Bronze Age layers of the high elevation settlement of Gegharot and from Late Bronze Age layers at Tsaghkahovit. Finds of these wild plants help to clarify botanical aspects of the paleoenvironmental conditions of the Aragats region during the Bronze Age.

The assemblage of cultivated plants at Tsaghkasar-1 Early Bronze Age settlement is similar to corresponding datasets from the contemporary settlements of Gegharot and Aparan-III (Hovsepyan 2009a, 2010a) in the same region, where inhabitants cultivated and consumed hulled barley, bread wheat and emmer. The site of Gegharot is situated north of Mt. Aragats, at the northern boundary of the Tsaghkahovit plain, at an elevation of 2100 m above sea level (Hovsepyan 2009a; Fig. 1), and site of Aparan-III is situated east of Mt. Aragats in the plain of Aparan on the right bank of Kasakh River, at 1860 m above sea level (Hovsepyan, 2010a; Fig. 1). Linear distances between Tsaghkasar-1 and these con-temporary sites are only 40-45 km, though the extreme topography makes effective distances somewhat greater. Carpo-logical remains belonging to *Buglossoides arvensis*, species of *Rumex*,

Polygonum, *Galium*, *Chenopodium* and the Poaceae, Fabaceae, Cyperaceae families are also recovered from the Early Bronze Age settlements of Gegharot and Aparan-III (Hovsepyan 2009a, 2010a). Unfortunately, poorer preservation and the relative scarcity of recovered plant remains at Tsaghkasar-1 do not allow more detailed comparison between these sites.

Conclusions

Palaeoethnobotanical investigations suggest that, in the Early Bronze Age, at least some of the inhabitants of the high mountain Tsaghkasar-1 settlement were settled and practiced agriculture based on the cultivation of tetra- and hexaploid wheats and barley. It appears that environmental conditions near the site in the Early Bronze Age were similar to present: cultivated plants and weeds recorded for the Early Bronze Age period of Tsaghkasar grow there at present and there is not any evidence of environmental change. Archaeobotanical data from Tsaghkasar-1, in conjunction with data from other sites of the region, confirm that Bronze Age people of Southern Caucasus practiced agriculture specialized in the cultivation of cereals. The Bronze Age agriculture in Southern Caucasus differs from earlier, Neolithic and Chalcolithic, and later, Iron Age, agricultures, when cultivation of pulses, oil-producing plants, and other plants was common (Hovsepyan 2010b). This emphasis on the cultivation and use of certain cereal grains at Early Bronze sites like Tsaghkasar can tentatively be added to a constellation of practices associated with the Kura-Araxes culture in the South Caucasus.

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Biosketch

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Supplementary Table. Carpological material from the Early Bronze Age period Tsaghkasar-1 settlement (from excavations in 2005 & 2008)**.**

Trench / UF				1/2	3/2	3/35	3/37	3/38		3/31	
Context				Building (Str.1)	Building (Str.1)	-	-	Pit		Pit	
Depth of samples, cm				-	-	-	338	80-90	130-140	80-90	200-210
Sample volume, liter			***520***	***165***	***75***	***30***	***80***	***50***	***50***	***10***	***60***
Concentration of carpological finds, per 10 liter sediment*			**2.62**	0,3	0,1	1,0	0,0	1,2	17,0	2,0	5,7
Plant taxa	**Finds**	**Total**	**136**	**5**	**1**	**3**	**0**	**6**	**85**	**2**	**34**
Cultivated plants											
Triticeae spp.	grains fragments (~, ml)		***2,7***	*0,5*	*0,1*	-	-	*0,5*	*1,0*	*0,1*	*0,5*
Triticum sp.	grains		11	-	-	-	-	1	4	-	6
	internodes fragments		**3**	-	-	-	-	-	3	-	-
Triticum sp.1 (hulled)	spikelet bases		**4**	-	-	-	-	-	4	-	-
Triticum cf. *aestivum* s.l.	grains		**19**	1	1	-	-	-	17	-	-
Triticum turgidum/aestivum (naked)	internodes fragments		**16**	-	-	-	-	-	14	1	1
Triticum aestivum L. (naked)	internode		**1**	-	-	-	-	-	1	-	-
Hordeum vulgare L.	grains		**22**	1	-	-	-	1	14	-	6
Weedy and wild plants											
Buglossoides arvensis (L.) Johnst. (= *Lithospermum arvense* L.)**	erems		**13**	-	-	-	-	1	10	-	2
Alkanna orientalis (L.) Boiss.**	erem		**1**	-	-	-	-	-	1	-	-
Rumex sp.	nutlets		**8**	-	-	-	-	-	-	-	8
Polygonum sp.	nutlet		**1**	-	-	-	-	-	-	-	1
Poaceae sp. (wild species)	grains fragments		**5**	-	-	-	-	-	4	-	1
Galium sp.	half mericarps		**2**	-	-	-	-	-	-	1	1
Scleranthus cf. *annuus* L.	fruit		**1**	1	-	-	-	-	-	-	-
Chenopodium sp.	seeds		**5**	2	-	-	-	-	2	-	1
Fabaceae sp. (wild species)	seed		**1**	-	-	1	-	-	-	-	-
Cyperaceae sp.	nutlet		**1**	-	-	-	-	-	-	-	1
Malvaceae sp.	seed		**1**	-	-	-	-	-	-	-	1
Unidentified species	seeds		**21**	-	-	2	-	3	11	-	5

Notes: * - Triticeae spp. grains fragments are not included in calculations

** - finds of Boraginaceae taxa are biomineralized, others are charred.