ENVIRONMENT AND DATING OF EARLY AGRICULTURAL SETTLEMENTS OF THE JEBEL SINJAR AREA (NORTHERN IRAQ)

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A mission from the Institute of Archaeology, Russian Academy of Sciences investigated three settlements in the Sinjar valley of Iraq during the 1970-es: Tell Magzalia (36°24' N, 42°15' E), Tell Sotto (36°19' N, 42°20' E) and Kül-Tepe (36°19' N, 42°18' E) (Bader, 1989) (Fig. 1). Several samples for pollen analysis and radiocarbon dating were also collected. Specialists from the Institute of Geography, Russian Academy of Sciences studied the pollen samples (Dr. Zelikson, Dr. Kremenetski) and provided radiocarbon dates (Dr Cherkinsky) (See table 1).

The Study Area. The maximum height of the mountain ridge Jebel Sinjar is 1457 m. The northern part of Iraq is characterised by a subtropical continental climate with cool, relatively wet winters and dry hot summers (Al-Shalash 1966). The majority of rainfall occurs in the winter, the remains – during the spring and autumn. The main soil types are reddish brown and brown soils with lithosoils in the mountain area. The piedmont of Zagros and East Taurus, where there is 300–500 mm of annual rainfall, is covered by grass-herb steppes, wormwood formations with *Artemisia herba-alba* Asso are widespread. Trees are represented by *Pistacia atlantica* Desf., *Prosopis stephaniana* (Willd.) Sprg. shrub. *Salix* spp., *Populus euphratica* Oliv., *Tamarix* spp. are found along rivers. Oak forests are found in the mountains, where *Quercus infectoria* Oliv. is dominant with *Crataegus* spp., junipers and *Prunus orientalis* Mill. North of Mosul province there is a 100 km^2 forest of *Pinus halepensis* Mill. at 900–1100 m. One of the southernmost locations of *Betula pendula* Roth. is found in the mountains near the Turkish border at 1840 m in elevation. In the Jebel Sinjar Mountains the modern lower limit of oak forest occurs at 800 m (Handel-Mazzetti, 1914; Guest 1966).

Table 1. Radiocarbon dates of samples from neolithic settlements Tell Sotto and Tell Magzalia.

Sample	Age, years BP	Laboratory number	Material dated
Tell Magzalia N1	8010 ± 50	IGRAS-772	"cold" humic acids
Tell Magzalia N1	7940 ± 50	IGRAS-773	"hot" humic acids
Tell Sotto N1	7150 ± 50	IGRAS-774	"cold" humic acids
Tell Sotto N2	7470 ± 60	IGRAS-769	"cold" humic acids
Tell Sotto N2	7010 ± 150	IGRAS-780	"hot" humic acids

Samples for radiocarbon dating were represented by a mixture of ash, sandy loam and small charcoals. Humic acids extracted from that mass were dated. Two fractions of humic acids were dated. First "cold" fraction was obtained by extracting humic acids with 2% NaOH. Than "hot" fraction was obtained after boiling of the same sample in 2% NaOH for two hours. The sample from Tell Magzalia was collected from the 10th cultural layer and corresponds to the late stage of Tell Magzalia existence. Samples from Tell Sotto were collected from bottom of the hole N 10, from the

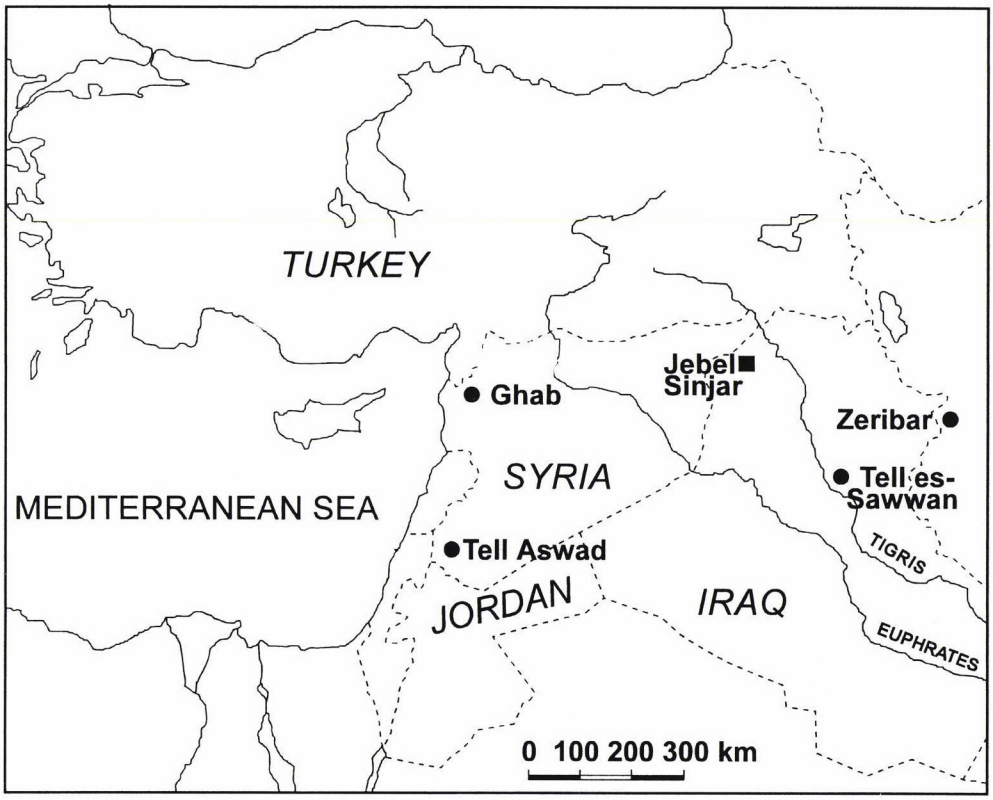

Figure 1. Location of the Jebel Sinjar area

earliest cultural layer 1–2 (Bader, 1989).

Tell Magzalia settlements belong to the Prepottery Neolithic B culture, from an archaeological viewpoint it can be correlated with the upper part of the Chayönü settlement and with the Ali Kosh settlement (Bader 1989). The age of the Tell Sotto settlement correlates well with radiocarbon dates of other Mesopotamian settlements: Telul eth-Talathat, Tell es-Sawwan and Matarrah.

Palynological samples were studied in the Institute of Geography of the Russian Academy of Sciences. The conditions for pollen preservation are generally very poor in sediments of ancient settlements. No pollen, or very little pollen, was found in a major portion of the samples. For example in 16 samples from Kül-Tepe and Tell Sotto only single pollen grains of Compositae and Apiaceae were counted. In the sample from the filling of a Hassuna vessel 5 from Tell Sotto few pollen grains of *Betula* and *Ceratonia siliqua*. It should be emphasised, that pollen spectra are selective as the result of poor pollen preservation. A lot of information so is lost. This conclusion is supported by the high percentage of deformed non-determined pollen grains (samples from Tell Sotto). In that paper we consider the results of analysis of the most pollen-rich samples. (Table 2).

Tell Magzalia. Sample N 1. Surface sample. It was collected from the modern soil surface on the western slope of a hill, 200 cm below the highest point.

Tell Magzalia. Sample N 2. It was collected in the western part of a square M-10 at a depth of 360–370 cm below the stone bases of the 9 cultural layer. Lower samples from Tell Magzalia had low pollen aboundances and are not considered here.

Table 2. Results of pollen analysis of samples from settlements Tell Magzalia, Kul–Tepe and Tell Sotto.

	Tell Magzalia sample 1		Tell Magzalia sample 2		Kul-Tepe sample 1		Tell Sotto sample 11		Tell Sotto sample 7	
	n	%	n	%	n	%	n	%	n	%
Abies	–	–	–	–	–	–	–	–	1	+
Picea	–	–	–	–	–	–	–	–	1	+
Pinus	29	+	5	+	3	1.5	2	+	7	+
Quercus	–	–	1	+	1	+	3	+	1	+
Quercus sempervirens	–	–	–	–	2	1	–	–	–	–
Tilia	–	–	–	–	–	–	–	–	1	+
Acacia	–	–	–	–	–	–	–	–	1	+
Ceratonia	–	–	–	–	190	95	–	–	–	–
Acer	–	–	1	+	–	–	–	–	–	–
Carpinus orientalis	–	–	2	+	–	–	2	+	1	+
Betula	–	–	5	+	4	2	1	+	1	+
Corylus	–	–	–	–	–	–	–	–	1	+
Alnus	–	–	–	–	–	–	1	+	1	+
Σ arboreal pollen	29	11.5	14	5	200	48	9	6	16	21
Centaurea sp.	–	–	1	+	–	–	5	4	–	–
Centaurea cyanus	–	–	–	–	–	–	–	–	2	4
Artemisia	22	11	3	1	1	+	6	4.5	–	–
Asteraceae	91	45.5	115	41	12	5.5	9	7	9	16
Cichoriaceae	44	22	21	8	20	9	24	18.5	32	56
Chenopodiaceae	5	2.5	9	3	2	1	–	–	–	–
Poaceae	5	2.5	50	19	3	1.5	7	5.5	5	9
Cerealia	–	–	5	2	–	–	10	8	–	–
Cyperaceae	–	–	–	–	–	–	–	–	1	2
Ranunculaceae	–	–	–	–	18	8	1	1	–	–
Lamiaceae	–	–	–	–	97	44.5	–	–	–	–
Malvaceae	–	–	31	12	4	2	1	1	–	–
Brassicaceae	–	–	–	–	35	15	1	1	–	–
Fabaceae	–	–	–	–	–	–	–	–	1	2
Rosaceae	2	1	–	–	3	1.5	–	–	–	–
Apiaceae	1	+	4	1.5	3	1.5	–	–	–	–
Plumbaginaceae	–	–	–	–	2	1	–	–	–	–
Caryophyllaceae	6	3	–	–	–	–	–	–	–	–
Geraniaceae	19	9.5	6	2	–	–	–	–	–	–
Dipsacaceae	1	+	6	2	–	–	–	–	–	–
Plantago	–	–	2	1	–	–	–	–	–	–
Thalictrum	–	–	6	2	–	–	–	–	–	–
Rumex acetosella-typ	–	–	1	+	–	–	–	–	–	–
Sanguisorba	1	+	–	–	–	–	–	–	–	–
Polygonaceae	–	–	–	–	–	–	6	4.5	–	–
Fagopyrum tataricum	–	–	–	–	–	–	1	1	1	2
Indetermined herbs	3	1.5	20	7	18	9	58	45	5	9
Σ non arboreal pollen	200	88.5	280	95	218	52	129	93	57	75
Polypodiaceae	–	–	1	+	–	–	1	1	–	–
Equisetum	–	–	–	–	–	–	–	–	2	2.5
Encalipta	–	–	–	–	–	–	–	–	1	1.5
Total pollen sum	229	100	295	100	418	100	139	100	76	100

n = number of pollen grains counted

Tell Sotto. Sample N 11. Is was collected in the western part of a square 10-C-3 from the black humic layer under dwelling surfaces of a cultural layer 4 from a depth of 190–200 cm below the zero point on the top of the hill.

Tell of Sotto. Sample N 7. It was collected in the southern half of a square 11-D-4 from a sterile loam horizon 290 cm below the zero point.

Kül-Tepe. Sample N 1. It was collected in section 8 on a square 55-C-2 from a layer with ash and charcoals from a depth of 80 cm below the zero point. This corresponds to the cultural horizon 3.

Surface sample. Surface sample from Tell Magzalia (sample 1 in table 4) reflects the present day pollen rain and allows us to compare its structure with present vegetation cover. The open treeless environment is reflected in the pollen spectrum. Few pine pollen grains were long distance windblown. Pine pollen was transported from pine forests which are still present in neighbouring mountains. A high percentage of wormwood reflects the important role of wormwood formations in regional vegetation cover. Domination of Compositae in the pollen spectrum partly reflects the serious human-induced disturbance of natural vegetation cover and partly reflects the selective preservation of Compositae pollen and destruction of less solid pollen of many other taxa. Compositae has been shown to be overrepresented in pollen spectra of soils and archaeological sites (Bottema 1975).

Samples from cultural horizons

Herb pollen dominates the pollen spectra from cultural layers of all settlements. This suggests treeless steppe vegetation in the region. A minor amount of arboreal pollen is present. Arboreal pollen is transported from the neighbouring mountains, likely from the nearest Jebel Sinjar Mountains. The structure of arboreal pollen allows some conclusions to be made about the regional vegetation cover.

Pine grew in the mountains, likely as it does today. Birch pollen is also blown in from the mountains. In early Holocene, birch was more widespread in the mountains of Turkey than later on. It is presently found near the upper tree line of the higher mountains in eastern Turkey (Bottema 1990).

Linden *Tilia* pollen is also likely long distant wind blown. The range of *Alnus* in the early Holocene was likely much wider than it is today. There is pollen evidence of it's growing in the Oront River valley (Bottema 1991). Alder likely grew in the Abra River valley – the closest river to the investigated area. Oriental hornbeam *Carpinus orientalis* Mill. is a typical element of oak forests of a Eu-Mediterranean type in Syria and south-western Turkey (Handel-Mazzetti 1914). At present oriental hornbeam, as well as evergreen oaks are absent in Iraq. Deciduous oaks and maples currently grow in Jebel Sinjar.

Ceratonia is a characteristic representative of a Mediterranean flora. One of the samples from Kül-Tepe was found to contain an unusually high amount of *Ceratonia* pollen, which likely suggests that *Ceratonia* grew in the settlement near the sample location. *Ceratonia siliqua* L. is a characteristic forest component in the Eastern Mediterranean. Its fruits are edible and were collected by prehistoric people. Later on *Ceratonia* was cultivated. Macrofossils of *Ceratonia* are known from archaeological sites of Israel, Jordan and Syria before 7000 BP (Behre 1990). The best known evidence of the use of *Ceratonia* fruits as food for pigs, and in the case of a bad yield – for people is given in Gospel of Lukas in parable about prodigal son (Lukas, 15, *15–16*).

The herb pollen structure in samples from the cultural layer is different from that one in surface sample, however there are some similarities. The presence of pollen of plants, connected with economic activity of people is the most significant. First of all we mention *Cerealia* pollen. In the natural environment pollen of wild grasses which is similar to the pollen of cultivated grasses is very rare. It is significant that in the pollen spectrum from the earlier settlement of Tell Magzalia *Cerealia* pollen makes up only 2 %, while in the sample from the younger settlement, Tell Sotto, *Cerealia*

content reaches 8 %. This allows the conclusion that agriculture was just very important in the economy of these settlements. Such a conclusion is verified by the presence of weeds pollen. Pollen of *Centaurea cyanus* L., *Fagopyrum tataricum* Gaertn., *Rumex acetosella* L. is recorded. These plants are usual weeds in crops.

The pollen spectrum from Kül-Tepe reflects a feature of vegetation, disturbed by human activity. The spectrum structure suggests that herbs from families of Brassicaceae and Lamiaceae grew near the sample site. These families include many species of weeds. The high proportion of malvaceous pollen in the sample from Tell Magzalia also suggests a high level of human induced disturbance in the area. Malvaceous plants are insect-pollinated, their pollen production is low, and in a natural environment a high percentage of malvaceous pollen is improbable. *Malva sylvestris* L. is widespread in the Near East. Seeds of *Malva sylvestris* L. were found in some neolithic settlements. Seeds of mallow *Malva sylvestris* L. are still collected by Bedouins.

The results of the pollen investigations correlate well with archaeobotanical data. Inhabitants of the Neolithic settlements of Sinjar valley cultivated cereals and beans. The collection of wild plants was still of some importance in the Tell Magzalia settlement (Lisitsina 1984). Bones of steppe and mountain animal species were identified. Domesticated animals appear in the middle part of the Tell Magzalia section and quickly became dominant. Nevertheless hunting was an important source of food for inhabitants of Tell Magzalia (Gadjiev 1989).

Conclusion

As a whole results of palynological investigations from three early Neolithic settlements from the Sinjar Valley in northern Iraq together with archaeobotanical and archaeozoological data allows the conclusion, that within 8000–7000 years BP in the Sinjar Valley the surrounding area was covered by steppes. Thickets of trees and shrubs, including alder, were found along the river. Forests dominated by oak occurred in the mountains. Eu-mediterranean trees were present there. Environment was favourable for farming and stock breeding. The local vegetation was disturbed under human pressure. Neolithic farmers cultivated cereals and pulses. The presence of farming is demonstrated by palaeoethnobotany and is reflected by the pollen indicators. Among domesticated animals sheep and goats were the most common. Plant gathering and hunting were still of some importance.

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