

**Malaysian Journal of Social Sciences and Humanities (MJSSH)**

Volume 3, Issue 5, November 2018

e-ISSN : 2504-8562

Journal home page:
www.msocsciences.com**Agropastoralism and Crops Dispersion: A Brief Discussion on Archaeological Sites and Main Discoveries in Archaeobotany in Central Asia****Muhammad Azam Sameer¹, Yuzhang Yang¹, Juzhong Zhang¹, Wuhong Luo¹**¹Department of History of Science and Scientific Archaeology, School of Humanities and Social Science, University of Science and Technology of ChinaCorrespondence: Muhammad Azam Sameer (mazamsameer23@gmail.com)**Abstract**

The sub-branch of archaeology, called archaeobotany connects present-day man with ancient plants. The ancient plant remains to give the picture of agro-pastoralists activities in Central Asia. Through the plant remains, the way of living, food habits, vegetation, economy and agricultural developments of Central Asia have been traced out. Archaeological sites give new insights of the agricultural denomination in the region, which revealed marked differences. Through archaeobotanical investigation of the plant remains like bread wheat (*Triticum aestivum*), rice (*Oryza sativa*), foxtail millet (*Setaria italica*), broomcorn millet (*Panicum miliaceum*), six-row barley (*Hordeum vulgare*), and other plant fossils provide new prospects about ancient food production in the expanse of Central Asia. A brief discussion on Central Asian archaeological sites and recovered plant remains as well as the agricultural exchange of Central Asia with the neighboring regions are the worthy discussion and essence of this paper.

Keywords: archaeobotany, archaeological sites, plant fossils, agropastoralism**Introduction**

Archaeobotany furnishes the connection of ancient plants with the ancient people (Miller, 2013). To know about the ancient agricultural activities about the regions of Central Asia, archaeobotany is a key tool. There are some important archaeological sites in Central Asia which are best illustrators about the past evidence regarding agriculture and social life. The agricultural history of Central Asia consists of plant remains which have been recovered from different archaeological sites after applying archaeobotanical practices. Currently, international academic circles have paid consideration to archaeological sites, sedimentary strata, advancement of crop analysis and identification methods (Pearsall, 2015). So, in present Era, Central Asian archaeobotany gets the high level to be chosen by the archaeologists to portray the agro-pastoralists history of the constituency of Central Asia. Archaeobotany interprets the different factors relating to plant remains (Miller, 1997). Unanimously plant remains are well to be examined regarding “macroremains” as well as “microremains”. The archaeobotanical range regarding Central Asian archaeological sites covers the macroremains which are larger in items having a bulk of plants remains including seeds, fruits wood and others (Miller, 1995). The ecological analysis on Central Asia also presents enough information about the agricultural range of this region. So, this move towards the plant-human connection adjoins a lively feature of the study of ecological and anthropological questions (Hastorf, 1999). In last few hundred years of

mankind history; most of the discussion has been done about plants or animals (Hastorf, 1999). In this regard, the analysis on Central Asian archaeobiology considered worthy to extract the hidden mysteries through plants. The Central Asian populations are often considered as mobile pastoralists (Spengler et al., 2013) but this label is still obscure. Since last few decades, the archaeobotanical results of Central Asia has been worthy regarding new plant remains have been recovered from different archaeological sites that speak about ancient crops. The area of Central Asia regarding its temperature, rainfall zone and territorial connection with surrounding (Fig 1) also shows the vivacity temperature effect on its agriculture and bindings with neighbor territories. In this respect, the further applications of the archaeobotany will lead the observers into the realm of reality about the agricultural features of Central Asia. As far as the plant remains of this region is observed, archaeobotany expose imperative objects which lead to knowing about a trans-regional interaction between East Asia and Southwest Asia (Spengler et al., 2014). But ecological patches give important resources for the herding system in Central Asia, in present and in past as well (Spengler et al., 2013). The area of the southern part of Central Asia belongs to Neolithic age (Pumpelly, 1908). Here, the focusing agricultural atmosphere from the Neolithic age to Iron Age and the findings from some of the archaeological sites present the true picture concerning with ancient people as well as agro-pastoralists activities of the locality. In past, Some of the manuscripts told about archaeological excavations and the practices of archaeobotany to extract the plant fossils and its further analyses in Central Asia to elaborate more clearer results of Central Asian archaeobotany. The archaeobotanical study of the neighboring countries of Central Asia can also show some of its ancient crops and their correlation with other regions. In this broad spectrum, the cemetery site called Xiaohe Cemetery; Xinjiang presents the relation Eastern Asia with Central Asia. The material got from Xiaohe structured a distinct signpost on the flat desert (Li et al., 2013). From Central Asia to Eastern Asia and then the Southern Asia, a rout of ancient crops, as well as ancient agro-pastoralists activities can be scrutinized well after some more archaeobotanical experiments on the material recover from archaeological sites.

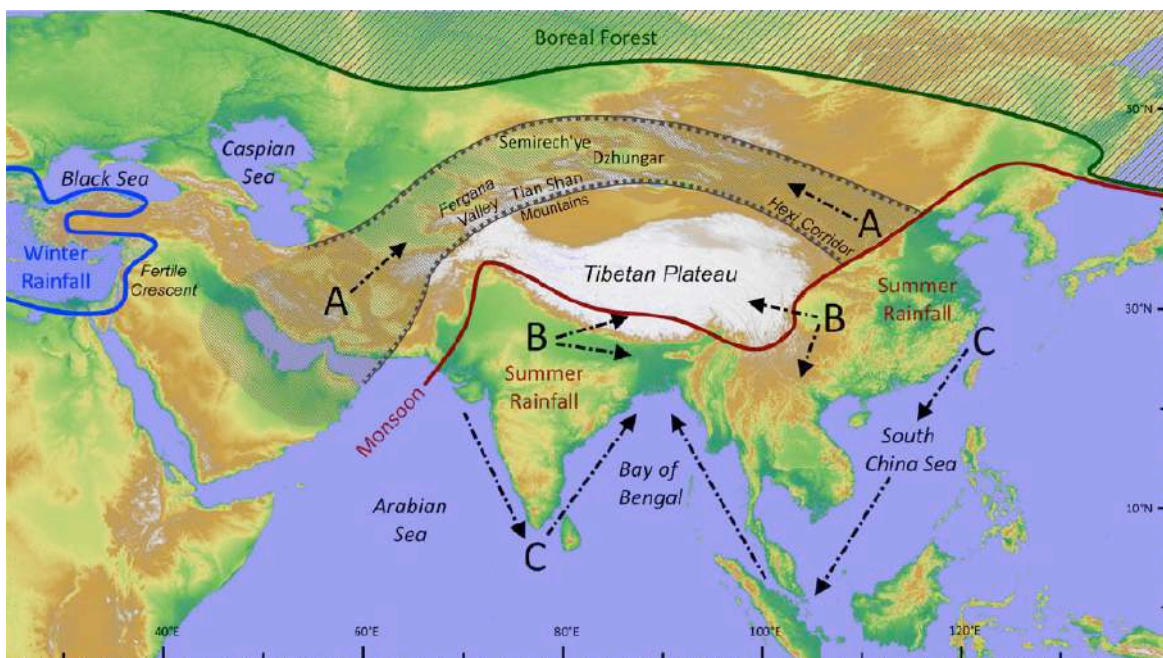


Fig 1 map illustrating the area of Central Asia and its temperature, rainfall zone and territorial association with surrounding countries showing vivacity of the influence on its agriculture and bindings with neighbor territories too. (Adapted from Stevens et al., 2016)

Brief discussion and archaeobotanical perspective of the archaeological sites

By the 1950s, plant remains were usually recovered and merely presented in the archaeological reports with the signs of the specific species (Heather et al., 2004). Since the mid-19th century, archaeologists had been saving plant remains from archaeological sites and the methodical sampling of archaeological

sediments by means of flotation, was a relatively recent expansion- until the late 1960s (Miller, 1995). The plant resources and its information about agricultural enhancement are helping hands for understanding the past conditions. Archaeological sites in Central Asia are difficult to be explored due to having mountainous features for the researchers until last few decades. Afterward, some archaeological institutions as well as foreign researchers made contributions toward the archaeological excavations and brought into new findings, which opened the prospects for coming generations. The short knowledge about the study in the region is even more motivating than the most primal archaeobotanical practices in the world were carried out in southern Central Asia (Spengler, 2015). Here, the important archaeological sites in Central Asia about materials and methodology are analyzed. With this, sites description and archaeological excavations are also briefly evaluated.

Anau, Turkmenistan, Anau site is situated in Turkmenistan and there a city name after Anau, which is the capital of Ahal Province, is 8 km southeast of Ashgabat. Due to city name, this archaeological site called Anau which is positioned to the north of the Kopet Dag (Miller, 1999). Anau site has three cultural mounds all have different traits about different Eras (Miller, 1999). Nathaniel Harrison and Wilma Wetterstrom scrutinized the samples related to Bronze Age from the south mound of Anau (Miller, 1999). In 1997, after the execution of archaeological excavation at Anau north mound, precious clues were originated which correlated with the earlier excavation of Kurbansakhatov. The results of agricultural activities came out after experiments and analysis. The sampling was intended to get utmost knowledge about agricultural activities. The barrel flotation was done in the field laboratory. It was an apparent fact that the people were agricultural people (Miller, 2003). Before the excavation of 1997, there had also archaeological excavation at 1904 carried out by the American geologist named Raphael Pumpelly, who later on turned as archaeologist (Harris, 1997), through which it was estimated by having evidence that Anau represented the Chalcolithic agriculture (Schellenburg, 1908). And the plant domestication was started there (Pumpelly, 1908). But earlier progress was not there until the domestication started at Neolithic site, called Jeitun which is 50 km away from Anau (Harris et al., 1993). The comparison of the Anau culture with Jietun culture was not matched and the attributes of the Anau people were different than Jeitun (Miller, 1999). Another important feature of the Anau site is that the Bronze Age samples were also recovered from its south mound (Harrison, 1995). The research on plant remains at Anau enlightened the system of irrigation. The extraordinarily plumpness of wheat and barley can be comparable with the plant remains found at Turkey and Syria.

Jeitun, Turkmenistan, About 30 KM Northwest of Ashgabat (Turkmenistan), Jeitun (an archaeological site) is positioned which is a Neolithic site (Robin, 2013). The settlement was occupied from about 6000 B.C. to 5500/5400 B.C. Some local institutions with the collaboration with the foreign scholars worked on the archaeobotany of this region. In 1950s and 1960s, the first excavation was executed by Professor VM Masson here (Robin, 2013). The small area (0.7 ha) on the edge of the Karakum desert range provided most comprehensive evidence of early agricultural land. With this, there were also goats and sheep raised here by the people of the region during .c. 6000 cal B.C (Harris, 1997). Jeitun Culture gives the picture of Neolithic economy and settlement pattern as well. Jeitun provided information about transition of agriculture over here. Comparing with Anau, which is Chalcolithic Age as well as the Jeitun belongs to Neolithic (Miller, 1999).

Sarazm, Tajikistan, Sarazm is an agricultural settlement which presents the early steppe, during the period of Fourth and Third millennia B.C. the clues of human population also found that show the chain (span the northern foothill ecotone of the Kopet Dag) of agro-pastoralist (Spengler et al., 2013). This site is named as Early Bronze Age agricultural population (Besenval et al., 1989). Talking about the division of Sarazm, it has the record about 4th millennium B.C. and late 4th millennium B.C. then Early 3rd millennium B.C. respectively (Spengler et al., 2013). Here at Sarazm the flotation work was done in 1973. The size of the mesh was 0.5 (mm) for the methodology of flotation and for the wet sieving 2.5 (mm) . During floatation process, countless seeds were extracted from soil but few of them few were saved completely for analysis and description. The most extensively used applications of archaeobotany come within the reach of the analysis of macroremains, which is observable to the naked eye (Pearshall, 2015). The analysis of macroremains at Sarazm, deeply hinted the food habits and agro-pastoralist strategies of the people. In 1990, George Willcox conducted archaeobotanical

survey and found some materials of that time that can be comparable with the present vegetation of Zarafshan Valley.

Kyzyltepa, Uzbekistan, This site (citadel and lower city) is situated near the modern town called Shurchi in Denau region of the Surkhandarya region of Southern Uzbekistan. Kyzyltepa is best to know Achaemenid period. Since 1970s, there had been surveys and excavations conducted at this site by some Soviet scholars, resultantly some built structures, as well as plant remains, were found (Wu, et al., 2015). In the later period, in 2010-2011 some foreign institutes worked here with the activities of archaeological aspects. This site belongs to the age of late Iron Age and other prescribed time is Achaemenid Age that shows the marks of agro-pastoral culture. This site is the biggest Iron Age site, well equipped with the summer irrigation of millet. As far as the current research (2010-2011) is concerned, this work provided the new data which firmly convinced the scholars to further do their investigation in the perspective of archaeobotany, in Central Asia. This data was in the form of archaeological knowledge, topography, spatial analysis etc. In the archaeobotanical context, the plant remains were retrieved by hand and flotation (10-liter bucket soil). The charred remains were stirred to release from muddy water.

Tasbas and Begash, Kazakhstan, from Eastern Asia to Southwestern Asia, the archaeobotanical methods on carbonized grains in Central Eurasia exposed the transformation (Spengler et al., 2014). The Tasbas and Begash (campsites) situated in the eastern side of Kazakhstan. The site of Begash has many phases chronologically such as one phase is related to Fedorovo culture which is belonging to c. 1890–1690 cal BC. It falls between Middle to Late Bronze Age (Panyushkina et al. 2010). After the experiments on these sites, the earliest tangible evidence of 3rd millennium B.C. about seasonally mobile herders came out here. The morphology of the seeds provided the concrete evidence of mobile pastoralists. In recent archaeological digging, the soil samples were amassed above mentioned sites for the practice of flotation work which came from occupation floors, burials, and hearths. The experiment on charred material in the context of archaeobotany was the key to open new windows of the further research (Miller, 1995). The material got from above-mentioned sites was examined in the laboratory that represented the picture of early mobile pastoralist activities. Usually, the pastures possessions where water is obtainable is the center of attention for mobile pastoralists of Eurasia (Spengler et al., 2013). Tasbas and Begash are the Bronze Age sites which transformed the early agricultural economies in Eurasian steppe zone in 3rd millennium B.C. Rice is one of the most vital crops throughout the world. But at these sites, there were no enough shreds of evidence of rice which showed the less use of rice in this region in 3rd millennium B.C

Gonur Depe, Turkmenistan, Gonur Depe is positioned in the Kara Kum desert close to Bayram-Ali, Turkmenistan. In present circumstances, this region is the desert. Gonur Depe has the vital figure among all the sites having the features of agricultural history in Central Asia. It is also a fact that through the middle Bronze Age the delta of the Murgab River was at Gonur depe. The irrigation system was also proficient there (Miller, 1993). Most of the samples comprised over dung charred and charcoal which were not examined due to unclear evidence (Miller, 1993). The grape seeds presumably were also found at the site of Mehargarh (Pakistan) like Gonur Depe. According to this archaeological excavation which was done in 1989, Fredrick Hiebert of the Peabody Museum that documented archaeobotanical data belonged to Gonur Depe. Dry sieved samples were dated to 2nd millennium B.C. The flotation and other archaeobotanical practices at Gonur Depe retrieved the hidden agricultural story of the area. The agricultural activities in 2nd millennium B.C. lead towards First millennium B.C. In the vicinity of Central Asia, It is also a fact that throughout eastern Central Asia, during the first millennium B.C. farming was there (Spengler et al., 2017). With the availability of plant macroremains, some other built structures also provided the architectural clues of the ancient juncture of the expanse.

Aigyrzhal-2, Kyrgyzstan, the series of Tien Shan Mountains in Kyrgyzstan considered being crucial as that was the passage for human culture spreading in the past. This region is attributed to a windy land. From the western side, it has Westerly Jet Stream which has the effect of seasonal pressure. Here the discussion about the important site of Kyrgyzstan having the traits regarding its history and archaeology. Aigyrzhal-2 is documented as the Mesolithic culture and also has the Bronze Age culture

with the approximation of 1st mid of the 2nd millennium B.C. (Matuzeviciute et al., 2015). Archaeobotanical data unanimously represented different aspects but the analyses of charcoal took the scholars into another way of observation. Here, the vital archaeological excavations were conducted by Aida Abdykanova with the collaboration of American University of Central Asia from 2012 to 2013 that provided new information about archaeobotany which got the attention of the archaeobotanists. Flotation, sorting, sieving, extraction and microscopic techniques were used to portray ancient agricultural interpretation.

Ojakley, Turkmenistan, In Turkmenistan, some of the archaeological sites presented the resources to know about the early agricultural activities in Central Asia. These sites belong to different Eras but unanimously these sites spoke about the agro-pastoral conditions of the region. Among these sites, Ojakley is fundamental. Ojakley is situated in the Murghab Region of Turkmenistan. This site is the best representative of the Late Bronze Age through which the depiction of that Era can be understood about agricultural values of the Central Asia. The conduction of archaeological excavations gave the knowledge about ancient agricultural activities of this region. Through data, the consensus has been matured regarding the patterns of the site and the survival of the population over here. In this region, plenty of ceramics as well as exotic minerals were discovered too (Rouse et al., 2014).

Tuzusai, Kazakhstan, From the eastern side of Almaty (Kazakhstan), this site is located which has the significant Iron Age features. But on the whole this site has the historical background of 410 B.C. and 150 A.D. (Spengler et al., 2013). Tuzusai is the unique in its agricultural evidences which present the Iron Age in Central Asia. The signs of herding maintenance are also the fundamental trait of this site. In 2002, Chang and his colleagues (Chang et al., 2002) conducted archaeological excavation which was the collaboration between Kazakhstan and American scholars which provided the clear marks of agricultural society. The remains of the cereals furnished the proof about the ancient farming of this region. Before this the local archaeologists carried out excavation in 1992-1994, different areas of the site were excavated and material of plants weeds and were recovered. The phytolith and macrobotanical analyses provided the new information about the agriculture of Tuzusai. Tuzusai had also the connection with other sites of Central Asia and this information was got after the extraction of some plant remains during the flotation. These sites include Anau, (the earliest Neolithic site) and Sarazm, (a Bronze Age site). During the excavation of 2008-10, this site was denoted as Iron Age site. The carbonized and un-carbonized seeds of the site were methodically identified by the scholars who worked at this site in different periods of time in the near past. The interesting characteristics of the plant remains were that the comparison and analyses on millets and wheat, was worthwhile and still it is not sure that which crop was preferred whether it was wheat or millet, which might fulfill the needs of the local people. To know the economy of Central Asia during Iron Age, the study of the Tuzusai is the undoubtedly indispensable.

Ancient plant remains and discussion about Central Asian archaeological sites

At Anau, with the recovery of plant remains like wheat and two-row barley (*Hordeum vulgare*), the abundance of wood charcoals together with some other plant fossils referred to both areas of north and south during the excavation of 1997. Here mostly hulled 6-row barley was found together with plump wheat. The small shrub like *Artemisia* was also found at the southern foothills of Anau, which is the sign of woody vegetation in this region (Miller, 2003). At Anau, the fruit remains like cherry (*Prunus avium*), peach (*Prunus persica*), almond (*Prunus dulcis*) and pistachio (*Pistacia vera*) also give the interesting evidence before the 2nd millennium B.C. **Jeitun,** In the 1980s, the research was taken place at Jeitun resultantly palaeoenvironmental consequences of the region came out (Harris, 1997). The investigation at Jeitun from 1989 to 1994 provided consequences that 6-row barley and wheat were cultivated here (Harris, 1997). Together with plant remains, Terracotta figurine (Cone), bone and stone tools were also found during the excavation in 1993 (Harris, 1997). Another important site named **Sarazm.**

Here, the plant fossils were free-threshing hexaploid wheat and barley; with these plant remains other macrofossils were also great in numbers like Russian olive (*Elaeagnus angustifolia*), hackberry (*Celtis*

occidentalis) and pistachio (*Pistachio vera*) as well as the charcoal assemblage of the trees. The charcoal of this region was from Bronze Age (Willcox, 2002). The analysis and depiction of wood charcoal at archaeological sites started from past sixty years (Asouti et al., 2005) and at Sarazm site the wood charcoal which was recovered, had been experimented archaeobotanically which gave the comprehensive interpretation too. At **Kyzyltepa**, the extensive of cereals like millets (Figure 2), bread wheat, six-row barley as well as pulses, fruits, wild plant remains and bones were found. After examining the material two valid hypotheses built, a. the Flora and Fauna of the Achaemenid Period came out with unique in its morphology and history; b. the material was attested in the farfetched laboratory which provides the new opening a window toward agricultural value in Central Asia. Two significant sites **Tasbas and Begash**, finding of these sites depicted the farming of millet, another plant fossils were wheat, barley, green peas (*Pisum sativum*) and legumes (*Fabaceae*) were cultivated here in a unique plan and strategy (Spengler et al., 2014). The records of ancient grains at Begash set up an essential reference for the increase of both wheat (Figure 3) and millet with the explanation of important tracks of the region (Frachetti et al., 2010). There was the diversity of different wild seeds at Begash (Figure 4) told about the existence of different crops in ancient times. The cereals grains of Tasbas and Begash furnished the plant food activities of Bronze Age as well. As far as **Gonur Depe site** is observed, the excavation in 1989 brought the new archaeobotanical results of Gonur Depe. From here barley, both hulled and naked forms, wheat, Lentil (*Lens culinaris*), Pea, grape (*Vitis Vinifera*) and some wild and weedy plant remains were also recovered. At Gonur Depe most of the plant remains were in the shape of carbonized wood, seeds and dung that is called mixed burned trash (Miller, 1999). **Aigyrzhal-2**, here, there was prominent and continuous visibility of the charcoal. Some of the samples were also selected for ^{14}C dating.



Fig 2 Millet from Kyzyltepa: (a) *Panicum miliaceum*; (b) *Setaria italica*. (Taken from Wu et al, 2015)

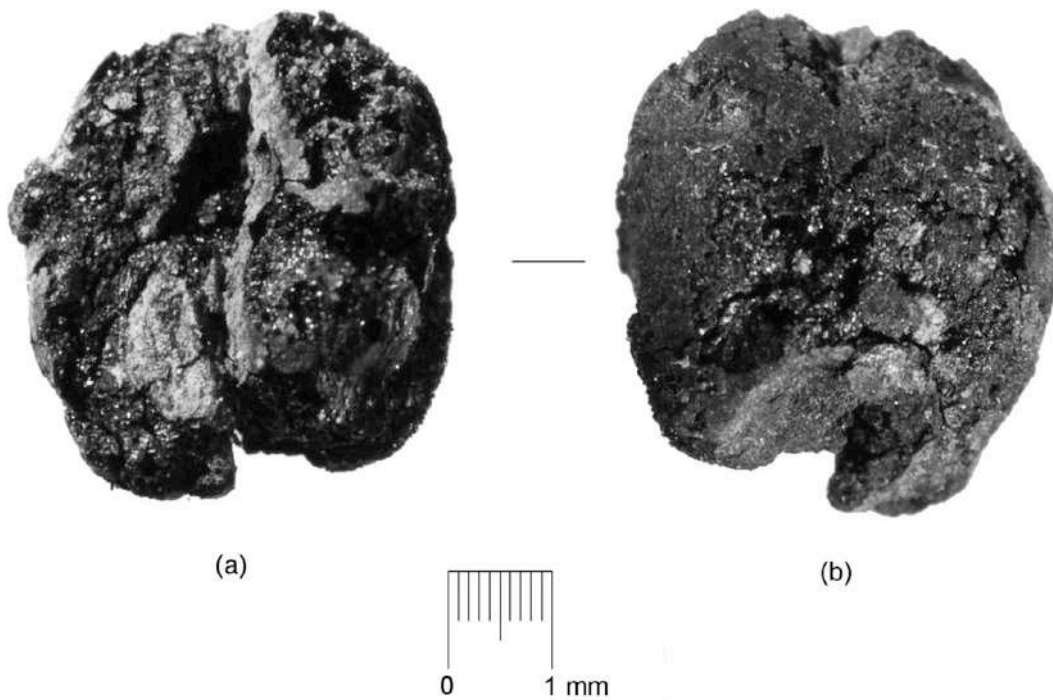


Figure 3 ventral and dorsal views of the seed of wheat recovered from Begash having dated to 2460–2150 cal. B.C (after Frachetti et al., 2010)

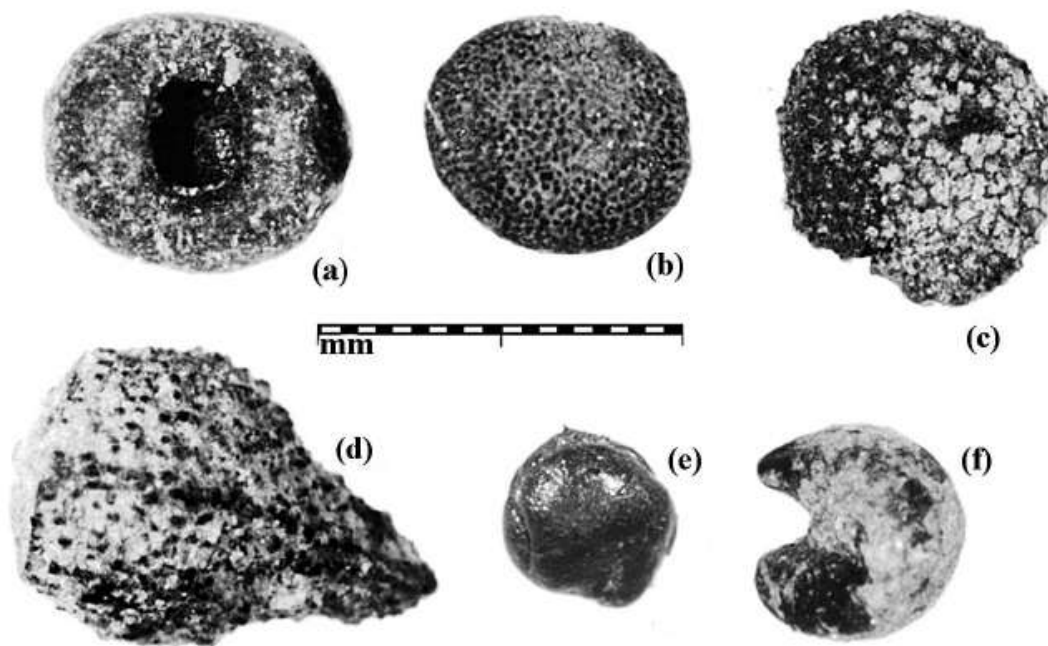


Fig 4 Begash seeds: Galium, Polycnemum, Hyoscyamus niger, Lithospermum arvense , Chenopodium sp. f and Malva (adapted from Spengler et al., 2013)

The remains of wheat (Figure 5), barley, wood charcoal, plant seeds, lithics and land snails etc. were great in numbers and distinctive. The most appealing thing of this site was the large time interval between the Mesolithic (12th millennium cal. BC) and Bronze Age (2nd millennium cal. BC). Small in area but chief in agricultural evidences, **Ojakley**, here the findings of the archaeobotanical remains

were worthwhile because charred wood was the most abundant material. The important plant remains were six-row barley, bread wheat and broomcorn millet. The evidence about the use of dung as fuel in the kiln was also a notable aspect of the site (Miller, 1984). Other valuable aspect of the site was the discovery of nine broomcorn millet grains one of which was directly radiocarbon dated to 3370±25 B.P. (Rouse et al., 2014). Consequently, Ojakley specified the Late Bronze Age (ca. 1500–1000 B.C.). This site has earliest proofs of mobile pastoralist activities as well. The economy of Ojakley is different from neighboring urban sites of that Era.

At **Tuzusai** the major finding were including wheat (Figure 6) barley, millet, a few grape seeds fragments and nutshell. But the true fact is that multi-cropping (seven crops) is another characteristic of the site. Wild foxtail millet across Eurasia, is commonly harvested, and could have been in the use for the cultivation at many places in Europe; it was found in relationship with Near Eastern crops (Wet et al., 1979). Most of the studies of plant food accomplished with the scientific analysis on cereal grains of this region (Fuller et al., 2009). The plant remains has different features of each site regarding agro-pastoral conditions of whole Central Asia. In the field of archaeobotany, the process of flotation has a key role. Flotation is one of the important techniques used by archaeobotanists to retrieve macroremains from soil samples (Castillo et al., 2010). During the techniques of archaeological excavation, archaeobotanical practices led to way into the seeds of wheat, foxtail millet, broomcorn millet, rice, six-row barley, green peas, legumes, fruits (Grape, Cherry, Peach, Almond and Pistachio), Russian olive, hackberry, wild plants and other macrofossils came in hand. Abundance of wood charcoals, together with some wheat and barley were recovered. Abundance of six-row barley and two-row barley had also been recovered from the Central Asian archaeological sites. From most of the sites, stone tools, land snails, bones, ceramics, Terracotta figurine(Cone)and architectural remains also found, which present the different social set up of ancient time giving the hints of agricultural, zoological, social, architectural and anthological configurations, through which a chain of agro-pastoral life was formed. At Anau, there are clear marks of cemetery too. In this regard, the connections of plant fossils with other existed structural remains, is interesting fact. At Anau, there was a cemetery contained mostly the children bodies (Miller, 2003). Such traditions also found the cemetery of the Xiaohe, Xinjiang (China), so, this region shaped a solid connection with Eurasian sites and became key place to form bridge between East to West (Li et al., 2013) most appealing thing about Anau site is the existence of extensive charcoal. With the six row barley and other cereals, the species of flowers also found there which is unique pronouncement about the plants of Central Asia. The important thing about Kazyltepa site is that this site has late Iron culture which unique. And it has also prominent chronological order from the Neolithic culture to late Iron Age culture. To know the conditions about Late Iron Age of Central Asia, Kazyltepa is best choice to do archaeobotanical study. The lifestyle of the ancient people belonged to this style can be judged through the experiments of the crops. The people of this region also had the practices of sheep, goats or cattle husbandry (Wu et al., 2015). Talking about Sarazm, the economy of the people of whole region was based on agriculture (Spengler et al., 2013). The pulses from Sarazm site are same as recovered from Anau and Jeitun sites. Some indications also observed that inhabitant of this region used cultivation of cereals with the herding practices of goats and sheep. The people were hunters that proved after examining the bones of some animals (Harris, 1997). The exchange of the crops inside the Central Asia is the crucial feature of this region but the exchange of the crops with the regions other than Central Asia, especially East Asia is the most fundamental aspects of the Sarazm. As Sarazm and Anau sites, Tasbas and Begash(campsites) are also important sites. The archaeobotany of these regions provides the information about the earliest transmission of the domestication as well as economies across Asia from 3rd to 2nd millennium B.C (Spengler et al., 2013). At the site of Begash, the presence of foxtail millet indicates its extensive use in the ancient times. In the history of mankind, the spreading of rice farming is considered to be essential and significant (Hosoya et al., 2010). The Central Asian region had also been dependent on rice like other regions. The free-threshing wheat at Tasbas (Kazakhstan) has been recovered from 2840B.C. to 2490 B.C (Spengler, 2015). The most archaeological sites in the world have been well known for the recovery of the millet with the genera like *Setaria italica* and *Panicum miliaceum* (Yang et al., 2012). The broomcorn millet and sorghum has been found in Central Asia and China which shows clear-cut interaction (Fuller et al., 2009). As far as Holocene vegetation and fire history of Central Asia is concerned, there obvious signs are existed too (Beer et al., 20017).The rice remains at some of the sites indicated its availability and its usages by the people. In Western Central

Asia, there were no evidences of millet earlier from Neolithic culture to early Bronze Age culture (Miller, 1999). Other important aspect of the plant remains is the accidental burning of plant remains (Miller, 1984). In this regard, some plant remains found in burned condition that also showed the fire activities of the region. The archaeological expedition to know about agricultural origins has a mission to find a key place where it all embarked on (Fuller et al., 2011). After long discussion, the important aspects of the Central Asian agriculture give the understanding about the ancient crops. Molecular studies also turn into the center in research toward the consideration about the beginning of agriculture, since past decades (Ehud et al., 2011). On the contrary, in Central Asia, molecular studies of the plants have been cultivated not in large context. Bronze Age in central Kazakhstan had various cultures (Lightfoot et al., 2015), during this age many of the archaeobotanical clues came out and through the procedural research on these archaeobotanical evidences, new horizons opened the windows for coming generations. In southern Central Asia, the system of prehistoric societies was the recognition of early irrigation canals (Lisitsina et al., 1981). Research has also been conducted along the series of Namazgda culture village sites which revealed the mix information about different Eras.

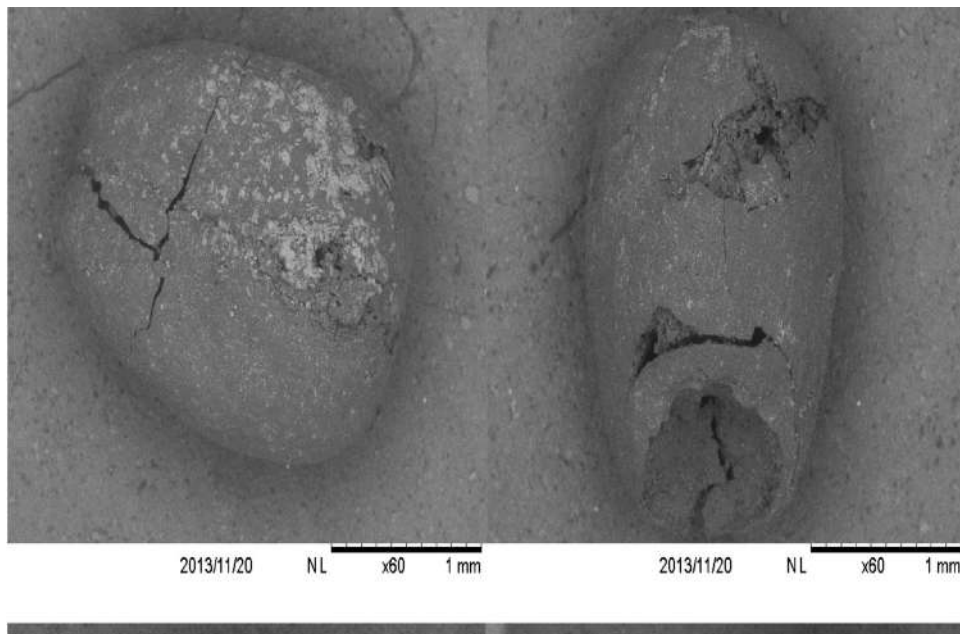


Fig 5 dorsal and ventral view of wheat grain (taken from Matuzeviciute et al., 2015).

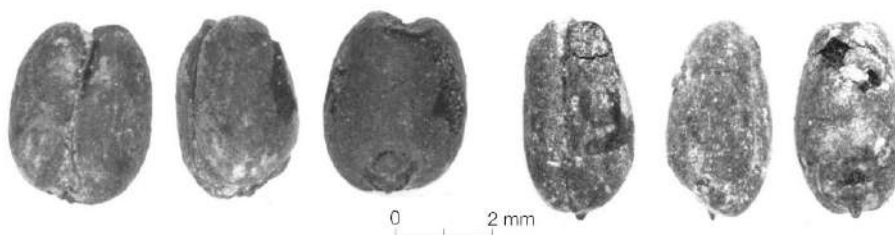


Fig 6 the different sides of the grains of wheat, (after Spengler et al., 2013)

Central Asian agro-pastoral life and its connections with neighboring Countries

By 7000 B.C, Near Turkmenistan, Iran and Pakistan had also earliest cereals specially hulled wheat in Central Asia (Charles and Bogaard, 2010; Roustaei et al., 2015). In Central Asia, Compact free-threshing wheat was transferred in other areas between c. 5500 and 4000 B.C. (Miller, 1999). This wheat was hexaploid because in 3000-2700 B.C. such hexaploid wheat recovered at Anau South

(Miller, 1999) and the signs of same hexaploid wheat existed in Harappan Miri Qalat, Southern Pakistan too (Tengberg, 1999). The wheat from Central Asia, Eastern Asia and Indus Valley had been found in same time but in different areas showed the clues of crops exchange (Spengler, 2015). From the northeast and southeast parts of Tibetan plateau, the spread of hexaploid free-threshing wheat and barley existed too. The investigations provided the facts that the transition of agriculture in Central Asia and its connection with neighboring counties was occurred due to the activities of hunters and gatherers or may be trade was the reason of it which was carried out via Silk Road. It is crucial to inspect the palaeoclimatic history of the region because the palaeoclimate investigation of Central Asia may also be helpful to get the agricultural feasibility and its transition with other regions. In 2nd millennium B.C, the ancient crops mainly the cereals have been exchanged from Xinjiang to southwest Asia (Spengler et al., 2017). The archaeobotanical research provided the earliest signs of common millet, found in China (Lu et al., 2009). In this regard, In western side of China called xinjinag through which millet was transferred from China to Central Asia. So, this place is a key through which the crops exchange from China to Central Asia and Europe carried out via ancient Silk Road (Li et al., 2013). Foxtail millet was extensively developed as a minor cereal across Eurasia but millet was also exchanged from China to Central Asia. But the cultivation of millet was practiced almost in all parts of the Eurasia too (Miller et al., 2016). If we talk about the Iran that also had agricultural interaction with Central Asia in the past. The similarities in the shape of ecology and economic between Iranian Plateau arid-steppe sites and Eurasian steppe sites are worthwhile (Miller, 1999). The plant remains from the Astana Cemetery that depicted the burial, vegetation and dietary culture of the Turpan region as well as the clues of exchange with neighboring regions (Chen et al., 2012). It means through the exchange of trade, the agriculture activities transferred from Eastern Asia to Central Asia. The earliest evidence for millet exploitation dated to 10000 years BP in North China (Yang et al., 2012). And talking about the similarities between Central Asia and Southern Asia, there is an obvious deep insight about agriculture. The same crops of Gonur Depe were also existed in South Asia especially in Mehargarh, Pakistan (Miller, 1993). The Central Asia and its neighboring countries like northern Pakistan, Xinjiang, Mongolia, southern Himalaya and Arabian regions had agricultural exchange in the past (Stevens et al., 2016) Again discussion about free-threshing wheat which recovered in Early Harappan sites during 3200 B.C. and 2600 B.C. as found in Central Asian regions(Fuller, 2011a). In 3rd millennium B.C. foxtail millet was found from Harappan site as close to the foxtail millet found at Tasbas, Kazakhstan, (Spengler, 2015). Before the mid-second millennium B.C, In Central Asia, broomcorn millet became visible earlier than foxtail millet and it was also transferred towards Yemen and Sudan via Arabian Sea (Fuller et al., 2009).

Conclusion

Archaeobotanical analysis on archaeological sites in Central Asia depicted the story about the ancient people who lived in an environment shared with all kinds of plants. The data presented in this article illustrate the agropastoral settlements after archaeobotanical experiments on plant remains which recovered from archaeological sites. The results of the experiments show the agricultural exchange of Central Asia with the neighboring countries. In this regard, the exchange of the ancient crops happened mostly via historical 'Silk Road'. The plant remains to reveal the economic development in Central Asia which enhances our thoughtful understanding of the diversity of economic systems. The recovered plant remains from the archaeological sites including cereals crops, wild plants, and fruits present coexistence of people and plants. The data from all archaeological sites prove that the archaeological inhabitants of this region were agro-pastoralists whom used agricultural possessions in their economy as well.

References

Aigyrzhal-2, Naryn valley, Kyrgyzstan", *Quaternary International* xxx (2015) 1e15, www.elsevier.com/locate/quaint

- Chang, C., P. Tourtellotte, K. M. Baipakov, and F. P. Grigoriev. (2002). "The Evolution of Steppe Communities from Bronze Age Through Medieval Periods in Southeastern Kazakhstan", (Zhetysu). Sweet Briar, VA: Sweet Briar College.
- Charles M and Bogaard A. (2010). "Charred plant macro-remains from Jeitun: Implications for early cultivation and herding practices in western Central Asia". In: Harris DR (ed.) *Origins of Agriculture in Western Central Asia: Archaeological and Environmental Investigations in Southern Turkmenistan*. Philadelphia, PA: University of Pennsylvania Press, pp. 150–165.
- Chris J Stevens, Charlene Murphy, Rebecca Roberts, Leilani Lucas, Fabio Silva and Dorian Q Fuller, (2016). "Between China and South Asia: A Middle Asian corridor of crop dispersal and agricultural innovation in the Bronze Age" *The Holocene*, Vol. 26(10) 1541–1555
- Christine A. Hastorf (1999). "Recent Research in Paleoethnobotany", *Journal of Archaeological Research*, Vol. 7, No. 1
- Cristina Castillo & Dorian Q. Fuller. (2010). "Still too fragmentary and dependent upon change? Advances in the study of early Southeast Asian archaeobotany" (pp. 91-111), London
- D. R. Harris, V. M. Masson, Y. E. Berezkin, M. P. Charles (1993). "Investigating early agriculture in Central Asia: new research at Jeitun, Turkmenistan" *Antiquity Publications Ltd 1993*, pp. 324-338
- David R. Harris, (1997). "Jeitun and the transition to agriculture in Central Asia", *Archaeology International*. <http://dx.doi.org/10.5334/ai.0109>
- Dorian Q Fuller, George Willcox & Robin G. Allaby .2011. "Cultivation and domestication had multiple origins: arguments against the core area hypothesis for the origins of agriculture in the Near East, World Archaeology", 43:4, 628-652, <http://dx.doi.org/10.1080/00438243.2011.624747>
- E. Lightfoot, G. Motuzite-Matuzeviciute, T. C. O'Connell, I.A.Kukushkin, V. Loman, V. Varfolomeev, F. X. Liui and M. K. Jones. (2015). "How 'Pastoral' is Pastoralism? Dietary Diversity in Bronze Age Communities in Central Kazakhstan Steppe" *Archaeometry*, 57, Pages 232–249, doi: 10.1111/arc.12123
- Ehud Weiss and Daniel Zohary (2011). "Neolithic Southwest Asian Founder Crops, Their Biology, and Archaeobotany" *Current Anthropology Volume 52, Supplement 4*
- Eleni Asouti & Phil Austin. (2005). "Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal macroremains" *Environmental Archaeology* pp1-18, DOI: 10.1179/146141005790083867
- Frachetti, M.D., Spengler, R.N., Fritz, G.J. and Mar'yashev, A.N. (2010). "Earliest direct evidence for broomcorn millet and wheat in the Central Eurasian steppe region", *Antiquity* 84: 993–1010.
- Fuller D.Q .2011a. "Finding plant domestication in the Indian Subcontinent", *Current Anthropology* 52(S4): S347–S362.
- Fuller D.Q and Boivin N. (2009). "Crops, cattle and commensals across the Indian Ocean: Current and potential archaeobiological evidence", *Études Océan Indien* 42–43: 13–46.
- G. Motuzaitė Matuzeviciute, R.C. Preece, S. Wang, L. Colominas, K. Ohnuma, S. Kume, A. Abdykanova and M.K. Jones. (2015). "Ecology and subsistence at the Mesolithic and Bronze Age site of
- Harrison N. (1995). "Preliminary archaeobotanical findings from 1994 excavations". In: Hiebert F (ed) *Progress Report, Harvard-IuTAKE Excavations at Anau South, Turkmenistan*. Report on file, Peabody Museum, Cambridge MA, pp. 28-35
- Heather L.P & Steven A.W. (2004). "Palaeoethnobotany: Modern Research connecting ancient plants and ancient peoples", Department of Anthropology, Washington State University WA 98686-9600, ISSN: 1040-8371, doi: 10.1080/07352680490273220
- Houyuan Lu, Jianping Zhang, Kam-biu Liub, Naiqin Wua, Yumei Lic, Kunshu Zhoua, Maolin Yed, Tianyu Zhang, Haijiang Zhang, Xiaoyan Yang, Licheng Shene, Deke Xua, and Quan Lia. (2009). "Earliest domestication of common millet (*Panicum miliaceum*) in East Asia extended to 10,000 years ago", Washington D.C.
- J.M.J. de Wet, L.L. Oestry-Stidd, J.I. Cubero. (1979). "Origins and evolution of foxtail millets (*Setaria italica*)" *journal d'agriculture traditionnelle et de botanique appliquée*, 26^e année, bulletin n°1, Janvier-mars 1979. pp. 53-64; doi : 10.3406/jatba.1979.3783, http://www.persee.fr/doc/jatba_0183-5173_1979_num_26_1_3783

- Jin-Feng Li, Idelisi Abuduresule, Francis M. Hueber, Wen-Ying Li, Xin-Jun Hu, Yue-Zhuo Li, Cheng-Sen Li. (2013). "Buried in Sands: Environmental Analysis at the Archaeological Site of Xiaohe Cemetery", Xinjiang, China. PLoS ONE 8(7): e68957. doi:10.1371/journal.pone.0068957
- Leo Aoi Hosoya, Yo-Ichiro Sato & Dorian Q. Fuller. (2010). "Editorial: the archaeobotany of early rice agriculture in Asia" *Archaeol Anthropol Sci* (2010) 2:57–59, DOI 10.1007/s12520-010-0034-z
- Lisitsina, Gorislava N. (1981). "The History of Irrigation Agriculture in Southern Turkmenia. In *The Bronze Age Civilization of Central Asia: Recent Soviet Discoveries*", Philip L. Khol, ed. Pp. 350-358. New York: M. E. Sharpe, Inc.
- Miller N.F. (1993). "Preliminary archaeobotanical results from the 1989 excavation at the Central Asian site of Gonur Depe, Turkmenistan", *Information Bulletin (International Association for the Study of the Cultures of Central Asia)* 19: 149–163.
- Miller N.F. (2003). "The use of plants at Anau North, A Central Asian Village at the Dawn of Civilization, Excavations at Anau, Turkmenistan" In: Hiebert F with Kurbansakhatov K (eds) Philadelphia, PA: University Museum Publications, pp.127–138, 201–215.
- Miller N.F. (1999). "Agricultural development in western Central Asia in the Chalcolithic and Bronze Ages. *Veg. Hist. Archaeobotany*" 8, 13–19. (doi:10.1007/BF02042837)
- Miller, N. F. (1984). "The Use of Dung as Fuel: An Ethnographic Example and an Archaeological Application," *Pale'orient* 10: 71–79.
- Naomi F. Miller. (1995). "Archaeobotany: Macroremains", *American Journal of Archaeology*, 99(1), 9-93. <http://dx.doi.org/10.2307/506880>
- Naomi F. Miller. (1997). "The Analyses of archaeological plant remains" A Simon and Schuster company upper Saddle River, New Jersey 07458, ISBN 0-536-59881-9
- Naomi F.M, Spengler R & Frachetti M. (2016). "Millet cultivation across Eurasia: Origins, spread, and the influence of seasonal climate", *The Holocene* 1–10 DOI: 10.1177/0959683616641742
- Naomi F.M. (2013). "Agropastoralism and archaeobiology: Connecting plants, animals and people in west and central Asia" University of Pennsylvania Museum, Philadelphia, PA, USA
- Panyushkina, I., C. Chang, A. Clemens & N. Bykov. 2010. "First tree-ring chronology from Andronovo archaeological timbers of Bronze Age in Central Asia", *Dendrochronologia* 28: 13–21. <https://doi.org/10.1016/j.dendro.2008.10.001>
- Pearsall D M. (2015). *Paleoethnobotany: A Handbook of Procedures*. 3rd ed. Walnut Creek: Left Coast Press
- Pearshall, D.M. (2015). "Palaeoethnobotany, A Handbook of Procedures", LEFT COAST PRESS, INC, 1630 North Main Street # 400, Walnut Creek, CA 94596 ISBN 978-1-61132-298-9, U.S.A
- Pumpelly [Raphael](#) (1908). "Explorations in Turkestan Expedition 1904 Prehistoric Civilizations of Anau origins, Growth, and Influence of Environment" Washington, D.C. : Carnegie Institution of Washington.
- Robin Bendrey. (2013). "Reviews of Origins of Agriculture in Western Central Asia: An Environmental-Archaeological Study by David R. Harris and Mobile Pastoralism and the Formation of Near Eastern Civilizations: Weaving Together Society by Anne Porter" Department of Archaeology, University of Reading, Whiteknights Box 226, Reading, RG6 6AB, UK
- Roland Besenval and Abdullah Isakov. (1989). "Sarazm et les débuts du peuplement agricole dans la région de Samarkand" URL: <http://www.jstor.org/stable/43484861>
- Rouse L.M, Cerasetti B. (2014). "Ojakly: a Late Bronze Age mobile pastoralist site in the Murghab Region, Turkmenistan", *J. Field Archaeol.* 39, 32–50. (doi:10.1179/0093469013Z.00000000073)
- Roustaei K, Mashkour .M and Tengberg. M. (2015). "Tappeh Sang-e Chakhmaq and the beginning of the Neolithic in north-east Iran". *Antiquity* 89(345): 573–595.
- Ruth B, Oliver H and Willy T. (2017). "Vegetation history, fire history and lake development recorded for 6300 years by pollen, charcoal, loss on ignition and chironomids at a small lake in southern Kyrgyzstan (Alay Range, Central Asia)", *The Holocene* 17,7, pp. 977–985
- Schellenburg HC. (1908). "The remains of plants from the north Kurgan, Anau. In: Pumpelly R (ed) *Explorations in Turkestan, expedition of 1904*", Carnegie Institute of Washington, Washington DC, vol 2, pp 471-473

- Spengler R.N and Willcox G. (2013). "Archaeobotanical results from Sarazm, Tajikistan, an Early Bronze Age village on the edge: Agriculture and exchange", *Journal of Environmental Archaeology* 18(3) 211–221.
- Spengler R.N, Cerasetti B, Tengberg M. (2014). "Agriculturalists and pastoralists: Bronze Age economy of the Murghab Delta, Southern Central Asia", *Journal of Vegetation History and Archaeobotany* 23: 805–820.
- Spengler R.N . (2015). "Agriculture in the Central Asian Bronze Age", *Journal of World Prehistory* 28(3): 215–253.
- Spengler R.N, Claudia .C & Perry A. T. (2013). Agricultural production in the Central Asian mountains: Tuzusai, Kazakhstan (410–150 b.c.)" Boston University, ISSN: 0093-4690 (Print) 2042-4582 (Online) Journal homepage: <http://www.tandfonline.com/loi/yjfa20>
- Spengler R.N, Frachetti M.D and Domani P.N. (2014). "Late Bronze Age agriculture at Tasbas in the Dzhungar Mountains of eastern Kazakhstan", *Quaternary International* 348: 147–157.
- Spengler R.N, Naomi F. Miller, Reinder Neef Perry, A. Tourtellotte and Claudia Cheng. (2017). "Linking agriculture and exchange to social developments of the Central Asian Iron Age" <https://doi.org/10.1016/j.jaa.2017.09.002>, *Journal of anthropological archaeology*
- Spengler R.N.. (2015). "Introducing archaeobotany to Central Asia" doi: 10.13140/RG.2.1.3969.0721
- Spengler, R. N., Frachetti, M. D., and Fritz, G. J. (2013). "Ecotopes and herd foraging practices in the steppe/mountain ecotone of Central Asia during the Bronze and Iron Ages", *Journal of Ethnobiology*, 33(1), 125–47.
- Spengler, R. N., Frachetti, M. D., Doumani, P., Rouse, L., Cerasetti, B., Bullion, E., and Mar'yashev, A., (2014). "Early agriculture and crop transmission among Bronze Age mobile pastoralists of Central Asia", *Proceedings of the Royal Society Series B*, 281(1783)
- Tao Chen, Yan Wu, Yongbing Zhang, Bo Wang, Yaowu Hu, Changsui Wang and Hongen Jiang .2012."Archaeobotanical Study of Ancient Food and Cereal Remains at the Astana Cemeteries, Xinjiang", China. *PLoS ONE* 7(9): e45137. doi:10.1371/journal.pone.0045137
- Tengberg .M .(1999). "Crop husbandry at Miri Qalat Makran, SW Pakistan (4000–2000 B.C). *Vegetation History and Archaeobotany*", 8(1): 3–12.
- Willcox, G. (2002). "Evidence for ancient forest cover and deforestation from charcoal analysis of Ten archaeological sites on the Euphrates", pp. 141–5 in Thiébault, S. (ed.), *Charcoal Analysis. Methodological Approaches, Palaeoecological Results and Wood Uses* (British Archaeological Reports International Series 1063). Oxford: Archaeo press
- Wu, X., Miller, N. F., & Crabtree, P. (2015). "Agro-Pastoral Strategies and Food Production on the Achaemenid Frontier in Central Asia: A Case Study of Kyzyltepa in Southern Uzbekistan", LIII 93-117. Retrieved from http://repository.upenn.edu/penn_museum_papers/1
- Xiaoyan Yang, Zhiwei Wan, Linda Perry, Houyuan Lu, Qiang Wang, Chaohong Zhao, Jun Li, Fei Xie, Jincheng Yu, Tianxing Cui, Tao Wang, Mingqi Li and Quansheng Ge. (2012). "Early millet use in northern China" Washington DC, www.pnas.org/cgi/doi/10.1073/pnas.1115430109