Research paper

Prehistoric trans-continental cultural exchange in the Hexi Corridor, northwest China

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Abstract

We report dozens of direct radiocarbon dates on charred grains from 22 archaeological sites of the Neolithic and Bronze Ages in the Hexi Corridor, northwest China, a key region for trans-Eurasian exchange in prehistoric and historical times. These charred grains include remains of wheat and barley domesticated in southwest Asia and broomcorn and foxtail millet which originated from north China. Together with previously published radiocarbon dates, we consider these newly obtained radiocarbon results in the context of material cultures associated with them, to explore an episode of trans-continental cultural exchange foci at the Hexi Corridor. Our results show that millet cultivators who used painted potteries from the western Loess Plateau first settled the Hexi Corridor around 4800 BP. Communities who cultivated wheat and barley moved into this region from the west around 4000 BP, bringing with them technologies and materials not seen in central China before, including bronze metallurgy, mud bricks, and mace heads. This was part of the east–west contact which became evident in the Hexi Corridor since the late fifth millennium BP, and continued over the subsequent two millennia, and predated the formation of the overland Silk Road in the Han Dynasty (202 BC–AD 220).

Keywords

archaeobotany, culture elements, Hexi Corridor, long-distance cultural communication, Neolithic and Bronze Ages, radiocarbon dating

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Introduction

It has been established that the Eurasian land mass had exchanges at a continental scale of people, material, agricultural products, and knowledge during prehistory (Frachetti et al., 2017; Sherratt, 2006). One important process could be described as trans-Eurasian exchange of domesticated plants and animals or 'Prehistoric food globalization' (Jones et al., 2011, 2016; Liu and Jones, 2014) and brought the Fertile Crescent originating 'Neolithic founder crops' to the East and Chinese domesticates such as millets to the West (Dong et al., 2017; Hunt et al., 2008; Liu et al., 2016a; Spengler et al., 2014; Stevens et al., 2016; Wang et al., 2017). This early episode of a globalization process has attracted scholarly attention with different methodological agendas (Boivin et al., 2012; Chen et al., 2015; Lightfoot et al., 2013; Liu et al., 2014), since it promoted cultural evolution and the expansion of human living spaces during Neolithic and Bronze periods across Eurasia (Diamond and Bellwood, 2003; Dong et al., 2016b; Kuijt and Goring-Morris, 2002).

Drawing on material cultural evidence, archaeological studies provide evidence for the trans-continental cultural exchange in prehistory. Comparative analyses on artifacts have demonstrated the eastern dispersal of material traditions of the Eurasian steppe (Frachetti et al., 2010; Oates, 1990; Rosenberg, 2010; Wertime, 1973), for example, bronze metallurgy and mud bricks that originated in southwest Asian were spread to east central Asia between 5000 and 4000 BP and then Northwest China between 4000 and 3000 BP (Muhly, 1985; Willcox et al., 2008; Roberts et al., 2009; Yang et al., 2016). Painted potteries that originated in western Loess Plateau of north China were introduced to the Hexi Corridor during 5300–4500 BP and spread further westward to Xinjiang and south Central Asia between 3800 and 3400 BP (Han, 2013; Institute of Archaeology of Chinese Academy of Social Science, 1994). Zooarchaeological studies suggest that sheep and horses were first domesticated in west Asia and western Eurasia Steep (Hongo et al., 2009; Warmuth et al., 2011) and spread to

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northwest China between 5600 and 4000 BP and 4000 and 3500 BP, respectively (Ren and Dong, 2016; Yuan, 2015). These studies provide valuable clues for reconstructing the timeline of cultural communication across Eurasia in prehistoric times; however, the exact timing for the prehistoric trans-continental cultural exchange remains unclear, because of the absence of sufficient reliable dates directly associated with the archaeological evidence.

Archaeobotanical studies and direct dating of charred crops grains from Neolithic and Bronze sites in key stations of the ancient Silk Road, a major passageway bridging China and the central and western parts of Eurasia in the last two millennia, can provide valuable perspectives for exploring prehistoric culture exchanges (Betts et al., 2014; Dodson et al., 2013; Dong et al., 2017; Liu et al., 2016b; Motuzaite-Matuzeviciute et al., 2013; Spengler, 2015;). The Hexi Corridor of northwest China is a key section of the Ancient Silk Road, and the area is also suggested as the hub for cultural exchange between west and east sectors of Eurasia during prehistoric times (Long et al., 2016); for Fertile Crescent plant and animal remains have been frequently identified in early Bronze sites of this area, along with foxtail millet and common millet, which originated in north China (Flad et al., 2010; Zhou et al., 2016). Previous studies have brought to lights a considerable number of direct dates from this region (Dodson et al., 2013; Liu et al., 2016a). Here, we augment that evidence by reporting radiocarbon results obtained from charred grains from the Bronze Age Hexi Corridor sites. By doing so, we seek a better understanding of the trans-continental cultural and agrarian exchange in prehistoric period.

To examine the timing for prehistoric long-distance culture exchanges in the Hexi Corridor, we collect flotation samples and identify crop remains from the Neolithic and Bronze Age sites in the area and directly date charred grains of different crops. We also review the archaeobotanical analyses and previously published radiocarbon measurements, together with archaeological studies, in the Hexi Corridor and surrounding areas. We aim to provide a new and more complete perspective for understanding the root for the formation of the Ancient Silk Road in the Han Dynasty.

Study area

The Hexi Corridor (92°21′E–104°45′E, 37°15′N–41°30′N) of northwest China spans from the Wushaoling Mountains in the east to the Yumen Pass in the west. It is oriented along a SE-NW axis between what is known as the Southern Mountains (including Qilian and A-erh-chin Mountains) and the Northern Mountains (including Mazong, Heli, and Longshou Mountain ranges). There are three main inland rivers in this region, the Shule, Shiyang, and Hei Rivers. The headwaters of these rivers are in the Qilian Mountains, and their hydrological systems give the forms of oases in an otherwise arid area. The Hexi Corridor is a key sector of pathways connecting central China with Xinjiang and Central Asia.

The cultural history of this region has been relatively well established by archaeologists (e.g. Li, 2009, 2011). The Neolithic of the Hexi Corridor consists of three types of the Majiayao culture: the Majiayao (5000–4600 BP), Banshan (4600–4300 BP), and Machang (4300–4000 BP). The Bronze Age cultures of this region include Qijia (4000–3600 BP), Xichengyi (4000–3700 BP), Siba (3700–3400 BP), Shajing (2800–2400 BP), and Shanma (3000–2400 BP).

Materials and methods

We investigated 50 sites of the late Neolithic and Bronze Ages in the study area during the field seasons of 2014 and 2015. Materials recovered from the field include pottery sherds, animal bones, stone artifacts, copper slag and ores, as well as botanical remains. Archaeobotanical samples were investigated from 22 sites in the Hexi Corridor (Figure 1). The choice of sites followed three principles: we select sites with identifiable pottery sherds in order to identify cultural setting; we selected well-sealed pit fills or cultural layers to minimize contaminating intrusions, and studies were conducted on cleaned sediment sections. A total number of 23 flotation samples were collected from the 22 sites (Table 1).

Charred grains used in this study were identified in the Paleoethnobotany Laboratory, Institute of Archaeology, Chinese Academy of Social Sciences, Beijing. Charred grains are preferable over charcoals to avoid possible reworked charcoal effects (Dong et al., 2014). In total, 21 samples were analyzed using accelerator mass spectrometry (AMS) at Peking University, Beijing, while two other samples were measured by AMS at Beta Analytic, Miami. Results were calibrated using Calib (v.7.0.2; Stuiver and Reimer, 1993) and the IntCal13 calibration curve (Reimer et al., 2013). All results are reported relative to AD 1950 (referred to as 'cal. yr BP').

Results

The results of the radiocarbon analyses are shown in Table 1. In the late Neolithic period, the oldest foxtail millet (*Setaria italica*) age is from Gaomuxudi in Suzhou County (4577–4825 cal. yr BP). A calibrated date of broomcorn millet (*Panicum miliaceum*) from Xitai in Gulang Country, and three calibrated foxtail millet dates from Duojialiang in Gulang Country, Guojiashan in Liangzhou Country, and Xichengyi in Ganzhou Country range from 3934 to 4413 cal. yr BP, falling within the chronological range of the Machang Phase (4300–4000 BP). Xihetan is part of the late Machang (4300–4000 BP) and Xichengyi cultural phases (4000–3700 BP). The foxtail millet there dates from 3900 to 4140 cal. yr BP.

Among the early Bronze Age sites, the earliest calibrated barley (*Hordeum vulgare*) age is from Lijiageleng in Gulang Country and ranges from 3588 to 3810 cal. yr BP; the earliest calibrated wheat (*Triticum aestivum*) age is from Huoshiliang in Jinta Country and ranges from 3703 to 3833 cal. yr BP, corresponding to the Qijia–Xichengyi period (4000–3600 BP). Four calibrated wheat dates from Xihuishan in Minle Country, Dadunwan and Shaguoliang in Yumen Country, and Ganguya in Suzhou Country range between 3399 and 3823 cal. yr BP, which are consistent with the Siba cultural period (3700–3400 BP). Among the late Bronze Age sites, two barley dates from Sanjiaocheng and Huoshitan in Minqin County are calibrated, and they range between 2727 and 2489 cal. yr BP, falling within the Shajing cultural period (2800–2400 BP). A barley grain from Sanjiaocheng in Jinchang County is analyzed and calibrated to 2156–2327 cal. yr BP, nearly 400 years later than the results from previous estimates based on contextual associations (Gansu Provincial Institute of Cultural Relics and Archaeology, 2001). Four calibrated barley dates from Huoshaogou and Gudongtan in Yumen Country, Guohuitai in Shandan Country, and Zhaojiashuimo in Suzhou Country range from 2942 to 2489 cal. yr BP, corresponding to Shanma period. A calibrated barley date from Lucheng in Ejinaqi Country ranges from 2009 to 2300 cal. yr BP, a little younger than the age range of Shanma culture (3000–2400 BP; Wang, 2012).

Most of the radiocarbon dates of the crops correspond well to the cultural ages established by typologies and artifacts associations. However, four radiocarbon dates of charred wheat and barley grains from three Machang sites including Guojiashan, Mozuizi, and Maolinshan are much younger than the previously estimated site ages. These dates range between 3073 and 3959 cal. yr BP, corresponding to Qijia, Xichengyi, and Siba periods (4000–3400 BP) rather than the Machang (4300–4000 BP). This demonstrates the importance of obtaining independent chronology.

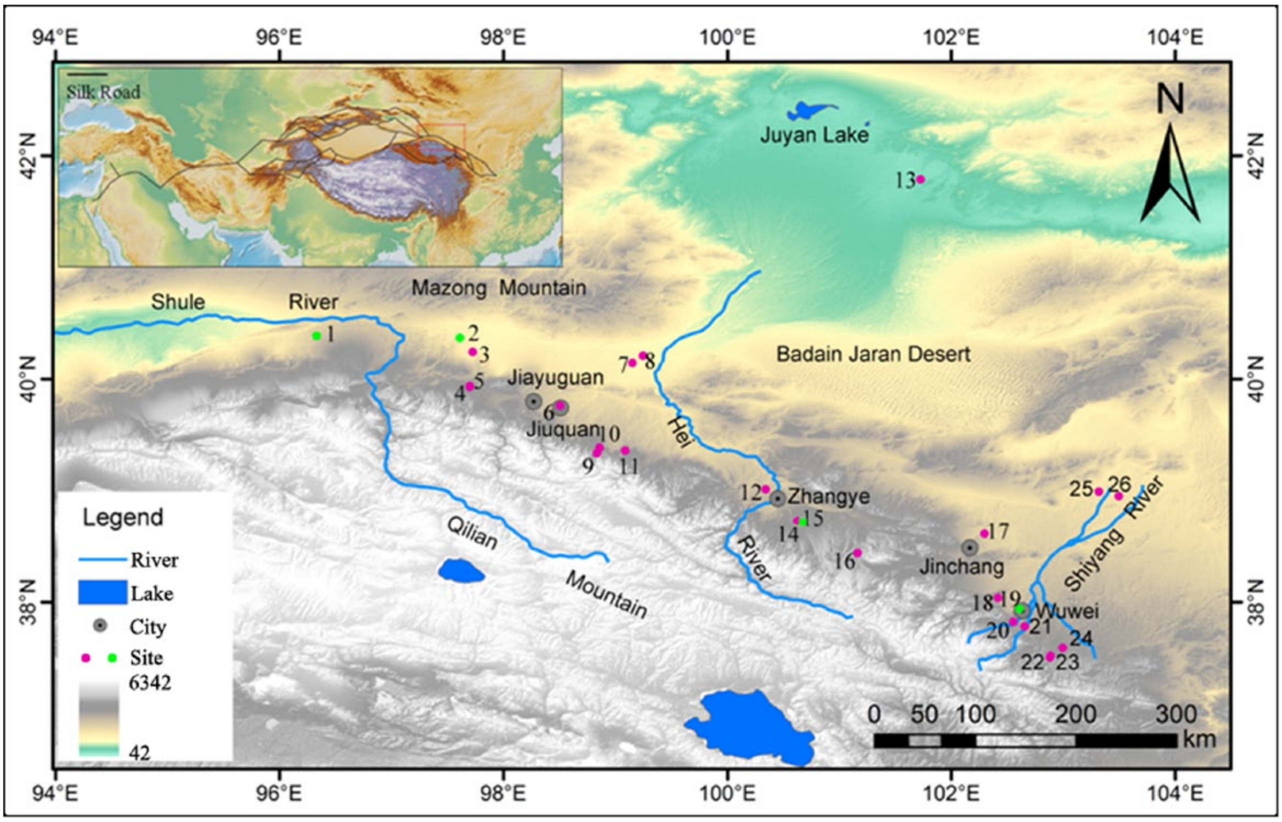

Figure 1. Distribution of prehistoric sites with archaeobotanical analysis and AMS dates in the Hexi Corridor.
1: Shaguoliang; 2: Gudongtan; 3: Shaguoliang; 4: Dadunwan; 5: Huoshaogou; 6: Zhaojiaoshuimo; 7: Ganggangwa; 8: Huoshiliang; 9: Ganguai; 10: Gaomuxudi; 11: Xihetan; 12: Xichengyi; 13: Lucheng; 14: Xihuishan; 15: Donghuishan; 16: Guohuitai; 17: Jinchangsanjiaocheng; 18: Guojiashan; 19: Huangniangniangtai; 20: Maolinshan; 21: Mozuizi; 22: Xitai; 23: Duojialiang; 24: Lijiageleng; 25: Minqiansanjiaocheng; 26: Huoshitan.
The red and green circle dots are the sites with new data and published herein.

Discussion

Grains under cultivation during prehistoric times in the Hexi Corridor and their implication for trans-continental cultural exchange

The results presented here allow us to comment on the timing of when millet cultivation was established in the Hexi Corridor. Our results are consistent with the previous hypothesis that in the Neolithic Age people began to settle the Hexi Corridor in the Majiayao cultural period (5300–4600 BP; Li, 2009, 2011). The oldest previously age of millet in this region is from Xihetan in the central Hexi Corridor and dated to 4405–3993 BP (Zhou et al., 2016). Here, our result of 4825–4577 BP revises the time older by a few centuries (Figure 2, Table 1). Suitable climate conditions of the late Neolithic period in the western Loess Plateau possibly provided pushing factors to population growth and the expansion of millet cultivation toward the northeastern Tibetan Plateau and the Hexi Corridor (An et al., 2003, 2010; Jia et al., 2013; Zhou et al., 2010). Our results show that no Fertile Crescent crops but only millet grains are recovered and directly dated to the Majiayao and Machang cultural periods (Table 1), and this is consistent with previous suggestions (Zhou et al., 2016). We can infer that between proximately 4800 and 4000 cal. yr BP people in the Hexi Corridor only cultivated the East Asian originating crops (millets). The southwest Asian crops and trans-continental cultural contact did not occur there before 4000 BP.

The general consensus of the eastern expansion of the southwest Asian originating cereal crops, including wheat and barley, is that they had migrated across Asia between proximately 6000 and 4000 BP and reached China before 4000 BP. This issue has recently been discussed by various authors (Barton and An, 2014; Betts et al., 2014; Flad et al., 2010; Spengler et al., 2014; Zhao, 2011) and argued with directly dated material from across Asia (Dodson et al., 2013; Liu et al., 2016a). Thus far, the oldest directly dated wheat in Central Asia is from Tasbas in eastern Kazakhstan 4565–4418 BP (Doumani et al., 2015). The earliest direct dated of a wheat grain in China is from Zhaojiazhuang, a Longshan cultural site in Shandong Province, and dated to 4510–4158 BP (Jin et al., 2011).

In the Hexi Corridor, no wheat or barley has yet been identified from Majiayao (5000–4600 BP) and Machang (4300–4000 BP) cultural phases. The oldest directly dated wheat grain in the study area is from Huoshiliang, dated to 4084–3843 cal. yr BP (Dodson et al., 2013). Charred seeds of wheat, barley, foxtail, and broomcorn millet are all identified from Huoshiliang and other Bronze sites in the central Hexi Corridor (Table 1; Liu et al., 2016a; Zhou et al., 2016). This implies that wheat had been introduced to the Hexi Corridor region by at least the early fourth millennium BP. To the east of the study area, wheat is subsequently documented at Jinchankou around 3900 BP, and the earliest barley remains from Gongshijia from the northeast Tibetan Plateau is dated between 3843 and 4067 cal. yr BP (Chen et al., 2015); to the west, it is documented from Xiaohe and Gumugou in eastern Xinjiang Province and dated to around 3700 cal. BP (Liu et al., 2016a; Zhang et al., 2015). These archaeobotanical evidence and direct dates of crop remains suggest trans-continental cultural exchange occurred in the Hexi Corridor and neighboring areas around 4000 BP.

The proportion of wheat and barley remains in the total archaeobotanical assemblage appeared to increase throughout the Bronze Age in the Hexi Corridor and became dominant after about 3700 BP (Zhou et al., 2016), while broomcorn millets and foxtail millets remained important crops during and before the Han Dynasty in this region. The remains of all these four major crops were frequently identified in Qijia, Xichengyi, and Siba cultural sites (Table 1 and Table S1, available online), indicating

Table 1. Calibrated ^{14}C data and domesticated crops from archaeological sites in the Hexi Corridor.

Site	Feature[a]	Laboratory no.	Dating material	Radiocarbon	Calibrated age (cal. yr BP)		County	Culture[b]	Crop remains
				Age (yr BP)	1σ	2σ			
Gaomuxudi	Cultural layer	Beta418808	Foxtail millet	4150 ± 30	4620-4816	4577-4825	Suzhou	Majiayao	FM: 13; BM: 4
Mozuizi	Ash pit	LZU15104	Wheat	2990 ± 25	3081-3213	3073-3316	Liangzhou	Machang	BM: 4; W: 10; B: 32
Xihetan	Cultural layer	LZU15101	Foxtail millet	3675 ± 35	3931-4083	3900-4140	Suzhou	Machang–Xichengyi	FM: 16389
Xitai	Cultural layer	LZU15105	Broomcorn millet	3700 ± 25	3987-4084	3934-4144	Gulang	Machang	FM: 122; BM: 49
Duojialiang	Cultural layer	LZU15114	Foxtail millet	3730 ± 20	4000-4145	3989-4149	Gulang	Machang/Qijia	FM: 118; BM: 35
Guojiashan	Cultural layer	LZU15118	Barley	3560 ± 25	3834-3899	3728-3959	Liangzhou	Machang	FM: 82; BM: 53; W: 4; B: 2
Guojiashan	Cultural layer	LZU15119	Foxtail millet	3890 ± 25	4295-4405	4248-4413	Liangzhou	Machang	FM: 90; BM: 102
Maolinshan	Cultural layer	Beta418807	Barley	2900 ± 30	2973-3071	2953-3156	Liangzhou	Machang	FM: 4; BM: 4; W: 2; B: 3
Lijiageleng	Ash pit	LZU15112	Barley	3415 ± 25	3635-3695	3588-3810	Gulang	Qijia	FM: 669; BM: 305; W: 67; B: 216
Xichengyi	Cultural layer	LZU15134	Foxtail millet	3745 ± 25	4013-4150	3988-4233	Ganzhou	Machang–Xichengyi–Siba	FM: 10; BM: 5
Huoshiliang	Cultural layer	LZU14225	Wheat	3495 ± 20	3722-3828	3703-3833	Jinta	Xichengyi	FM: 39; BM: 91; W: 5
Shaguoliang	Cultural layer	LZU15107	Wheat	3250 ± 30	3410-3555	3399-3561	Yumen	Siba	FM: 1034; BM: 150; W: 331; B: 321
Dadunwan	Cultural layer	LZU15110	Wheat	3155 ± 20	3361-3395	3346-3445	Yumen	Siba	FM: 31; BM: 19; W: 66; B: 57
Xihuishan	Cultural layer	LZU15109	Wheat	3445 ± 20	3643-3809	3638-3823	Minle	Siba	FM: 486; BM: 42; W: 6; B: 8
Ganguya	Cultural layer	LZU15117	Wheat	3435 ± 20	3641-3704	3633-3821	Suzhou	Siba	FM: 62; BM: 5; W: 21; B: 50
Sanjiaocheng	Cultural layer	LZU15113	Barley	2500 ± 25	2503-2714	2489-2725	Minqin	Shajing	BM: 17; W: 11; B: 14
Huoshitan	Cultural layer	LZU15122	Barley	2505 ± 20	2510-2716	2492-2727	Minqin	Shajing	FM: 3; BM: 23; W: 60; B: 8
Sanjiaocheng	Cultural layer	LZU14218	Barley	2230 ± 20	2162-2313	2156-2327	Jinchang	Shajing	BM: 23; B: 15
Gudongtan	Cultural layer	LZU15116	Barley	2520 ± 35	2505-2734	2489-2744	Yumen	Shanma	BM: 4; W: 6; B: 26
Zhaojiashuimo	Cultural layer	LZU15115	Barley	2630 ± 20	2747-2758	2742-2770	Suzhou	Shanma	FM: 2; BM: 1; B: 15
Guohuitai	Ash pit	LZU13159	Barley	2505 ± 20	2510-2716	2492-2727	Shandan	Shanma	W: 6; B: 17
Huoshaogou	Ash pit	LZU15121	Barley	2770 ± 25	2800-2920	2789-2942	Yumen	Shanma	W: 3; B: 36
Lucheng	Ash pit	LZU14224	Barley	2140 ± 25	2065-2291	2009-2300	Ejinaqi	Shanma	FM: 27; BM10; W: 5; B: 5

FM: foxtail millet; BM: broomcorn millet; W: wheat; B: barley.
[a]^{14}C samples collected from.
[b]Cultural attribute speculated by unearthed artifacts.

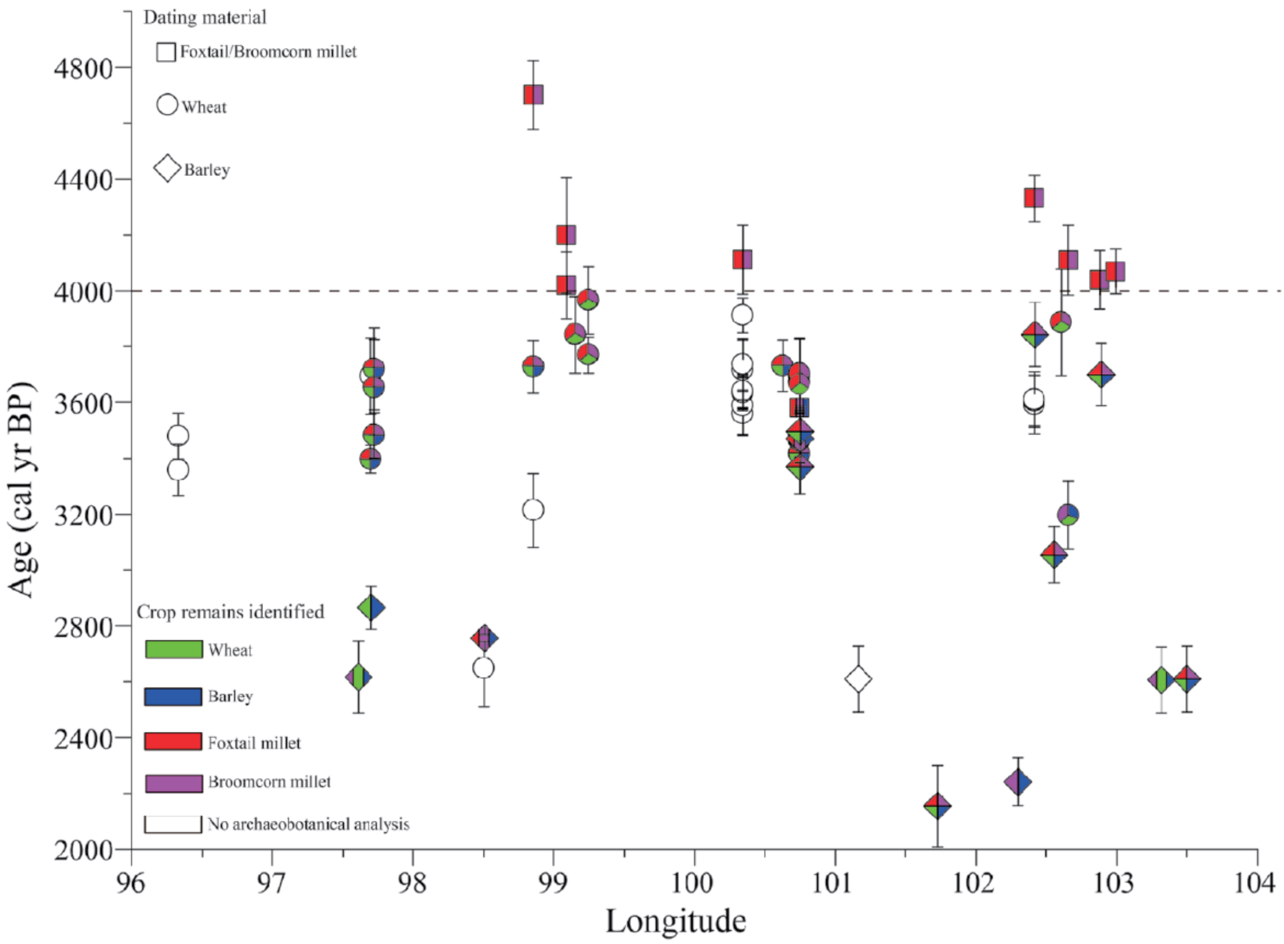

Figure 2. The comparison between the direct dates of crops remains and the geography of prehistoric sites unearthed from the Hexi Corridor.

the strengthening of trans-Eurasian cultural/agricultural exchange by and after 4000 BP. This phenomenon is further revealed in the evidence of isotopic dietary analyses of proteins from human and animal skeletal remains. In the Hexi Corridor, a distinct dietary shift from consumption of dominantly C_4-based food resources to consumption of both C_4 and C_3 foods occurred around 3900 BP (Liu et al., 2014). Similar dietary shifts have been documented for the upper Yellow River region at about 3600 BP (Ma et al., 2016). This agrarian–culinary transition can be understood in the context trans-Eurasian exchange of crops as a simultaneous dietary change took place in both southern Kazakhstan and the Hexi Corridor regions (Liu et al., 2016b; Long et al., 2016; Wang et al., 2017).

Material evidence in the context of prehistoric trans-continental exchange

There is considerable material evidence in the context of cultural exchange between the west and east. The archaeological record during the Neolithic includes painted ceramics which appear in all sites of the Majiayao (4600–4000 BP) and Machang (4300–4000 BP), but bronze vessels have only been found in two Machang cultural sites, Gaomuxudi and Zhaobitan in the central Hexi Corridor (Figure 3; Li, 2011). After the Neolithic, however, the frequencies for bronze vessels, mace heads, and mud bricks unearthed from the Bronze Age sites (4000–2200 BP) in the Hexi Corridor evidently increased in comparison with the Machang period (Figure 3), indicating trans-continental culture exchange was probably enhanced after 4000 BP. This is in accordance with the region's archaeobotanical evidence (Chen et al., 2015; Dong et al., 2016a; Wang et al., 2017).

Bronze smelting technology and mud bricks were introduced into east central Asia between 5000 and 4000 BP (Doumani et al., 2015; Spengler and Willcox, 2013), and a center for copper smelting appeared in the south Ural Eurasian steppes around 4500 BP (Chernykh, 1992). Patterns of painted pottery (engrailment) of Banshan style of Majiayao culture in Gansu-Qinghai area share similar characteristics with those of Namazga culture IV-V (5000–4000 BP), which may have been influenced by pottery technology from south Central Asia (Kohl, 1981).

After the mid-fifth millennium BP, archaeological evidence from the Hexi Corridor suggests that cultural elements from east Asia spread to Central Asia by the way of the Hexi Corridor. For example, patterns of painted pottery spread to Xinjiang and then influenced Chust cultures in south Central Asia in the late Bronze Age (Han, 2013). At the same time, the cultural elements of West Asia and the Eurasian steppes spread to east Central Asia and then to northwest China according to the known ages for carved stone wares; metallurgy of copper and iron; beads made from carnelian, lapis lazuli, gold, turquoise, chalk, silver, mace head, and gold ware as symbols of power and domesticated sheep, horses, and cattle; and architectural technology using mud brick (Spengler, 2015).

Bronze metallurgical technology appeared in Mesopotamia during the end sixth millennium BP and spread to central Asia during 5000–4000 BP (Muhly, 1985), with influence in the Hexi Corridor and other parts of China after 4000 BP (Roberts et al., 2009; Yang et al., 2016; Zhang et al., 2017). The earliest mace head evidence appeared in Pre-Pottery Neolithic and early phases of the Pottery Neolithic (Yarmukian culture, 8400–7800 BP) of the southern Levant (Rosenberg, 2010), and copper or stone mace head was also found in many archaeology sites dating back to 8000–5000 BP in West Asian (Moorey, 1988). Then, they spread to Central Asian and

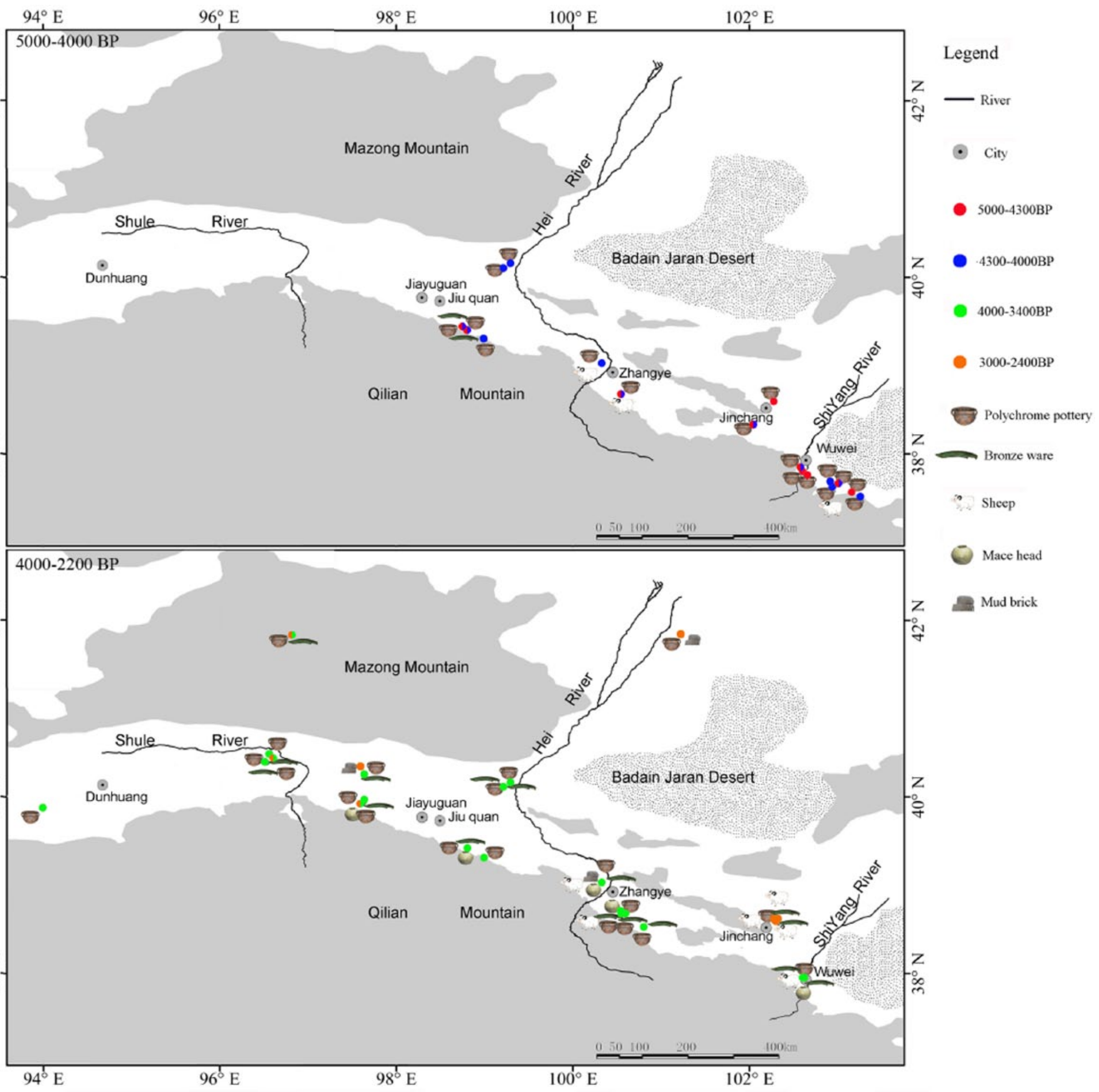

Figure 3. The distribution of Neolithic and Bronze sites with polychrome pottery, bronze vessels, sheep, mace head, and mud bricks in the Hexi Corridor.

further eastward disseminate to east Asia in late Neolithic and Bronze Ages (Li, 2010), for example, copper–stone mace heads have been found in Xichengyi and Siba cultural sites in the Hexi Corridor and northwest China with ages from 4500 BP (Chen et al., 2014; Li, 2016). Archaeological evidence reveals that the earliest mud brick buildings appeared in the Near East in Pre-Pottery times of the Neolithic and then apparently spread quickly to other areas (Dani and Masson, 1992; Kuijt and Mahasneh, 1998). Mud brick technology appeared in Northern Iran; Southern Central Asian; Eastern Central Asian, and the Hexi Corridor, Xinjiang, and Inner Mongolia in 8000 BP, 8000–7000 BP, 5000–4000 BP, and after 4000 BP, respectively (Cao et al., 2010; Chen et al., 2014; Dani and Masson, 1992; Doumani et al., 2015; Harris et al., 1996).

The emergence and intensification of cultural exchange across Eurasia in the late prehistoric period was promoted by the development of long-distance conveyances (Anthony, 2010; Di Cosmo, 2002), such as domesticated horses and chariots that were first utilized in central Asia by the fifth millennium BP (Anthony, 2010; Kuzmina, 2008). These advancements in transportation may have been crucial in facilitating migration of humans and technology from about the early fourth millennium BP (Frachetti, 2009; Kuzmina, 2008). This early exchanges profoundly influenced human and culture evolution in the Old World (Christian, 1994; McNeill, 1963) and was accompanied with major genome mixing between Europe (Haak et al., 2015) and Xinjiang Province of northwest China (Li et al., 2010). The emergence and intensification of this long-distance exchange post 4000 BP also significantly influenced culture evolution in the Hexi Corridor and surrounding areas, which was attributed to an important factor to induce the transition from one dominant culture (the Qijia culture) to a diversification of many coexisting cultures in different regions of Gansu and Qinghai Provinces in northwest China around 3600 BP (Ma et al., 2016).

Conclusion

Systematic dating of the remains of millet, wheat, and barley unearthed from Neolithic and Bronze sites in the Hexi Corridor, provides an expanded dataset for exploring human settlement in this area and early trans-continental culture exchange with the

Old World. The data indicate that millet farmers had settled in the Hexi Corridor by 4800 BP, with the production of painted pottery that originated from north China. Cultural elements from west Asia including wheat, barley, and bronze vessel, for example, had been introduced first to central Hexi Corridor before 4000 BP and then spread rapidly mainly along the west-eastward axis. Thus, trans-continental cultural exchange emerged in the Hexi Corridor in very late fifth millennium BP and intensified in the Bronze Age, and which laid the foundation for the formation of Ancient Silk Road in Han Dynasty.

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