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EDITED BY
Luqman Jameel Rather,
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REVIEWED BY
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GL Bajaj Institute of Technology and Management (GLBITM), India
Shahid Adeel,
Government College University,
Pakistan

*CORRESPONDENCE
Paula N. Doumani Dupuy
✉ paula.dupuy@nu.edu.kz

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A Wooly Way? Fiber technologies and cultures 3,000-years-ago along the Inner Asian Mountain Corridor

Paula N. Doumani Dupuy [1]*, Kubatbek Tabaldiev [2] and Giedre Motuzaite Matuzeviciute [3]

[1]Sociology and Anthropology Department, Nazarbayev University, Astana, Kazakhstan, [2]Faculty of Humanities, Department of History, Turkish Manas University, Bishkek, Kyrgyzstan, [3]City Research Department, Lithuanian Institute of History, Vilnius, Lithuania

Wool-focused economies yielded a pastoralist materiality that visibly shaped the lived experiences of Central Asian populations today. In this paper, we investigate the earlier application of fibers through a key mountain corridor for social interactions during Prehistory. We focus on the site of Chap 1 located in the highlands of the Tien Shan Mountains of Kyrgyzstan where researchers have found a complex agropastoral subsistence culture was established from at least *ca.* 3,000BCE. The perishable materials that would have accompanied the early spread of cultural and technological traditions related to fiber-based crafts throughout this area are under-documented due to poor organic preservation. Hence, there has been little consideration of the role that textiles played in highland occupation and how woven fabrics might have facilitated settlement in the extreme climates of Central Asia. We address this ongoing problem through a multi-application survey of Chap's unpublished textile evidence preserved as impressions in coarseware ceramics of its Final Bronze Age. We consider evidence that sheep wool formed a key cultural adaptation for surviving the extreme winters of Central Asia's highland regions.

KEYWORDS

Kyrgyzstan, Chap, textiles, wool, mountains, Bronze Age, archaeology, SEM

1. Introduction

Human settlement of high mountain territories rests on several biological and cultural adaptations. Biological studies point toward the importance of physiological and genetic adaptations, whereas a long history of cultural adaptations has created a distinct body of material-cultural traditions and socio-economic networks (Manderscheid, 2001; Lévêque, 2013; Postigo, 2013; Melekhova et al., 2018; Dransart, 2019). Among such processes, human investments in the care and cultivation of sheep and goat for making textiles foreshadowed various cultural and biological adaptations for surviving the extreme winters of Central Asia's highland regions. However, the resulting textiles, their associated technologies, and indications of connections further afield are not well studied, nor are the range of raw materials that may have accompanied cultures of wool in the region. This is partly due to the notoriously poor

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preservation of textiles in archaeological sites of Central Asia's mountain zones. Fortuitously, 'Textile Pottery', artifacts of cloth imprints that were baked into the surface of ceramic vessels, form a regular component of ceramic assemblages from the steppes and mountainous regions of Central Asia/Eurasia that make it possible to access the textile record of its Bronze and Iron Ages (Glushkov and Glushkova, 1992; Orfinskaya et al., 1999; Doumani and Frachetti, 2012; Medvedeva, 2017). Here we report on a recently uncovered body of Textile Pottery from the *ca.* 3,000-year-old (1065–825 call BC) high-altitude farming site of Chap 1 situated at 2000 m asl. in the Tien Shan Mountains of Kyrgyzstan (Motuzaite Matuzeviciute et al., 2020a) and situate it in the regional and local context of textile materialities (Figure 1).

1.1. Textiles and early civilization

The sheer impact of textiles on the development of human civilizations cannot be overstated. While scarce in terms of preserved fiber remains, the use of plants to create twined fabrics predates evidence for the earliest known pottery containers (Adovasio et al., 1996) that transformed how humans stored, prepared and served foods. Within the past 10,000 years, textiles have since further impacted and shaped society in countless ways (Barber, 1991a). For example, textiles, woven from plant and animal fibers both, are documented trade items in several cultures around the world, raising attention to the coupling of textiles and mobility among early civilizations (Dayalan, 2021). From a social-economic point of view, wool as a raw material has been linked to textile intensification and workshop production in agro-pastoral contexts of urban southwest Asia (McCorriston, 1997), and as a key component underlying early social complexity (Sabatini et al., 2018; Grossman and Paulette, 2020). In terms of technological properties, the mechanical properties of wool, which appeared with domestic sheep breeds possibly from around the 4th millennium BCE, brought several technological advantages and paved ways for new forms of self-expression; it could be dyed vivid colors, encouraged the development of new textile structures and textures, and could both warm and cool the skin (Barber, 1991a; Gleba, 2012). In central Eurasia, from the limited preservation of its ancient textile record, woolen textiles appear to have partnered the movement and spread of a range of early pastoralist technologies and lifeways (Shishlina et al., 2022).

1.2. Wool in Bronze Age Eurasia

In contrast to the mountains of Central Asia, the Eurasian steppe to its north contains several examples of extant textiles

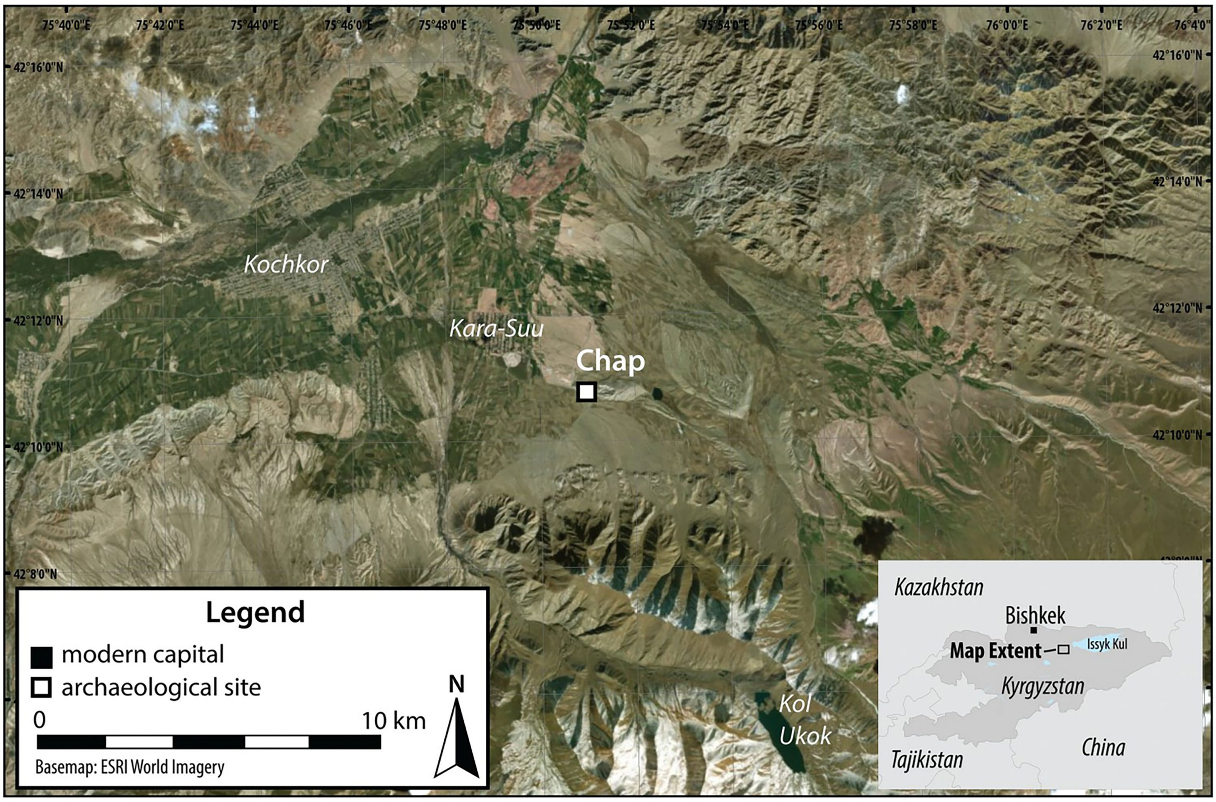

FIGURE 1
Location of the study site of Chap in Kyrgyzstan's Tien Shan along the IAMC.

recovered from burial contexts (as well as Textile Pottery) of the Bronze Age (2nd millennium BC). The steppe textiles consist of various uses of wool embellished with other raw materials such as fur, metal, and other hair fibers (Orfinskaya et al., 1999; Kupriyanova, 2008; Usmanova, 2010; Shishlina et al., 2022). Bayesian modeling of directly dated woolen textiles from 26 Bronze Age sites from across the Eurasian steppe suggests that woolen textile technologies (and hence sheep/goat) reflect some of the timing and direction of pastoralist movements and technologies; woolen textiles spread north from the Caucasus into the Eurasian steppe at the 3rd millennium BC and from there moved eastward reaching as far as Xinjiang by the late 2nd millennium BC (Shishlina et al., 2020). However, discoveries of earlier textile cultures show a predominance of wild plants that predate this phenomenon in the Kazakh steppe (Olsen and Harding, 2008). Additionally, several decades of research on the renowned Bronze Age Tarim Basin textiles (e.g., Barber, 1991b, 1998; Good, 1998; Wagner et al., 2011) have also noted a near exclusive preference for wool in creating textiles from which a rich variety of weaves, colors, garments, and ritual-utilitarian items were achieved. However, investigations of the spread of textiles and partner technologies through the mountains that border these regions (see Doumani Dupuy et al., 2018) have been overshadowed by significant discoveries related to the early globalization of foodways across Eurasia (e.g., Spengler, 2015; Zhou et al., 2020). If wool was similarly important in the Inner Asian Mountain Corridor (IAMC), it rests to then consider its contributions to local adaptations and mobility through the IAMC parallel to other processes linked to other highland trans-Eurasian exchanges more closely tied to subsistence, diet and ideology (e.g., Frachetti, 2012).

1.3. The Chap 1 site

Mountains occupy around 95% of Kyrgyzstan's landmass and today a considerable portion of the country's economy rests on wool production where this fiber makes its way into tourism, and into the agricultural and clothing industry (Beksultanova et al., 2021; Komorowska et al., 2022). The prehistoric site of Chap 1 is located 200 km southeast of the capital and economic center of Bishkek, in the Kochkor Valley. The geographic location and period of occupation of Chap 1 place it within the Chust Archaeological Cultural tradition (Tabaldiev, 2005). At 2,000 m asl., Chap 1 domestic plants and animals (sheep/goat) supported intensive agropastoral subsistence and occupation of this highland ecotone (Motuzaite Matuzeviciute et al., 2020a). Published archaeological studies on the Chap 1 material outline that agropastoralists occupied the site for much if not all of the year to tend to plants and manage animals – and during this time they would have woven textiles, formed pottery, and forged bronzes, among other crafts in their wheelhouse (Ananyevskaya et al., 2020; Motuzaite Matuzeviciute et al., 2020a, b). Zooarcheological analysis of the Chap I fauna demonstrates a primary focus on sheep followed by goats for meat and wool (Ananyevskaya et al., 2020). The mortality/kill-off profiles of the sheep/goat and significant presence of older animals fit closely with Payne's (1973) wool model. Spindle whorls and bone points were also recovered that indicate local production of textiles at Chap 1, but whether the wool harvested at the site ended up as the principle textile material or was perhaps accompanied by plant-based fibers, such the bast family of plants that grow wild in this region, have not been confirmed to date.

2. Materials and methods

Excavations of a 6.5 × 6.5 m unit at the Chap 1 site recovered a domestic structure with living spaces and internal pit hearths and high concentrations of pottery sherds mixed through the cultural fill (see Motuzaite Matuzeviciute et al., 2020a for detailed site description). A small proportion of these ceramic sherds contain textile prints to their inside surface, a bi-product of using textile-lined molds to shape the lower portion of handmade pottery containers (Doumani and Frachetti, 2012). The Textile Pottery is associated with the site's use between 1,065–825 cal. BC. A sample of 60 individual specimens were selected from the bulk pottery assemblage of >1,000 coarseware sherds at Chap 1. While studies of fabric impressions in pottery conventionally examine plastic replicas of the prints to record structural and technical aspects of the cloth (Drooker and Webster, 2000), our study further incorporates higher resolution analytical tools to evaluate the raw material choices linked to high altitude cultural adaptations at Chap 1.

2.1. Silicone casts of sherds viewed with SLR camera

Plastic putty replicas were made of the negative textile impressions to render a 3-dimensional positive version of the original cloth (Figure 2). The casts were photographed with an SLR camera and viewed in Photoshop to record preliminary observations of weave structure, yarn evenness and twist direction, surface texture (such as wooliness) and regularities/irregularities in the surface topography (Figure 3).

2.2. Digital microscopy of sherds

In tandem with visual observation of the plastic replica, a structural evaluation of the textile was performed with a ZEISS Smartzoom 5 digital microscope at Nazarbayev University. The microscope was employed for its high-resolution capabilities and z-stacking function at magnifications of ×20 and ×50. Built-in ZEISS software was used to perform measurements of thread count and width, and spacing between woven elements (Figure 3B). Grömer's typology of weave densities based on thread

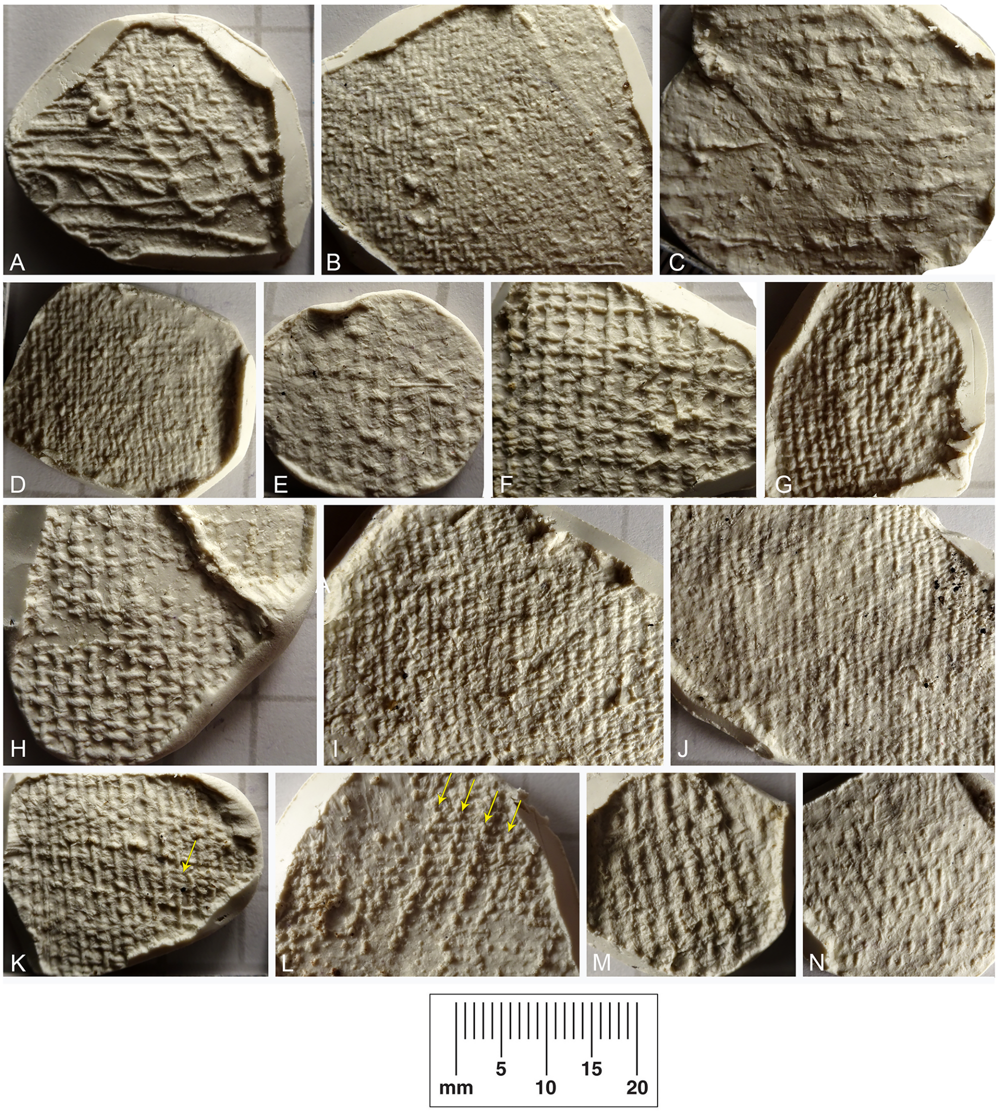

FIGURE 2
The different weaves from Chap 1. **(A,B)**=2/2 twills with a frayed edge. **(C–H)**=various tabby structures. **(I–L)**=repp (**K** shows multiple wefts grouped in an irregular pattern. **(L)** shows a 'ribbed' texture created by alternating between compacted wefts and open areas that expose the warp). **(M,N)**=possible hand-twined textiles.

counts/cm was used to assign coarse, medium-fine, fine, and very-fine textile structures (Grömer, 2016: Fig 62; Figure 3B). The stereo microscope furthermore allowed for preliminary observation of fibers that appeared exceptionally curly, straight, or tangled, etc., of which these samples were selected for higher resolution study using scanning electron microscopy.

2.3. Silicone casts viewed with scanning electron microscopy

SEM was employed to identify potential raw materials through close study of individual fibers and strands, which, to date, has not been employed in visual assessments of regional Textile Pottery, only for its preserved textiles of which there are few. Silicone replicas of Textile Pottery were mounted on aluminum stubs with double sided tape, sputtered with 40 nm of gold and then loaded into a JEOL IT-200 scanning electron microscope housed at Nazarbayev University. Optimal depth of field and surface topography were achieved between 5 and 20 KV. Magnification at intervals of ×30 (overall view), ×100 and ×200 (to record the fiber morphology and to perform diameter measurements) produced grayscale 3D images to use in the analysis (Figure 4). Surviving fiber remnants and their morphological characteristics were sought as plant fibers (such as bast or hemp) and animal fibers (such as the coats of sheep) contain diagnostic differences; the former contain linear formations and dislocations perpendicular to the fiber axis and

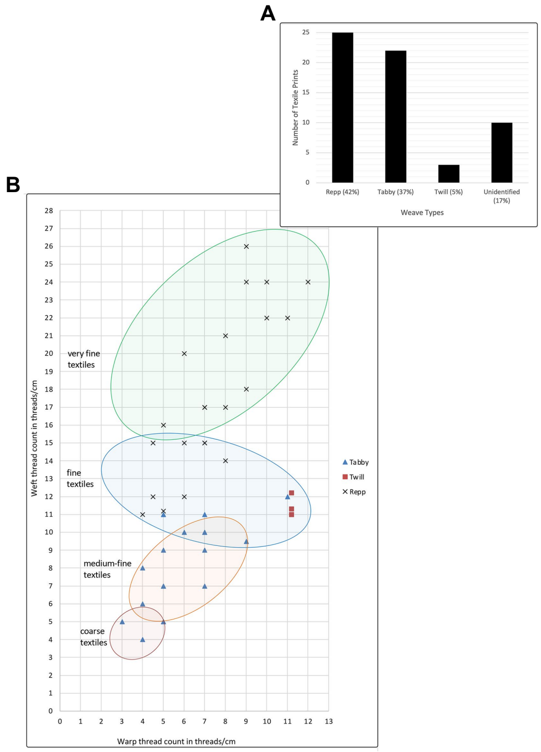

FIGURE 3
(**A**, top right) Bar chart showing percentages of counts of the different weaves from Chap 1. (**B**, bottom left) Thread counts for the different weave types recorded at Chap 1. Ellipses group the coarse, medium-fine, fine, and very-fine textile structures based on element counts/cm (after Grömer, 2016: Fig. 62).

the latter have cylindrical strands with scales (Gleba, 2017, p. 10; Rast-Eicher, 2016, p. 80). For animal fibers, the diameter measurements were also important for distinguishing the outer coat of sheep containing coarse kemp (over 100 μ), hair (over 60 μ), and the much finer underwool (as little as 10 μ) all present in primitive sheep, and less so in later domestic breeds (Rast-Eicher, 2016, p. 264).

2.4. Limitations

Our study incorporates indirect textile evidence of woven fabrics in the form of prints, and not extant textiles. Textile Pottery as a body of evidence impose some restrictions on the depth of interpretations due to some finer details being lost in the coarser texture of the ceramic and from shrinkage of the prints when the clay is fired. Moreover, as these are prints from a small portion of textile, the selvage or frayed edge ideal for distinguished warp from weft was not present. Notwithstanding, optical microscopy still allows for *relative* measurements of threads to be gathered and then compared further within or across assemblages. The thicker and harder spun elements in the prints are designated as the warp, and the thinner and/or looser spun elements as weft (c.f. Rast-Eicher, 2016, p. 48). The high detail observed with SEM also allows minimum and relative diameter measurements of fibers to be collected. It also yields grayscale 3D images of the samples' finest surface topography, from which raw materials of plant or animal fiber can sometimes be told apart based on their distinct morphological and textural characteristics as outlined above (Rast-Eicher, 2016, p. 12).

3. Results

3.1. The weaves

The study of 60 Textile Pottery specimens from Chap 1 convey a variety of weaves including tabby, repp, and twill examples, and weaving techniques (both loom woven and hand-twined; Figures 2, 3). The smallest component of the Chap 1 Textile Pottery (5%) constitutes fine twills woven in a 2/2 even pattern (Figures 2A,B). These twills are woven with thin, z-twisted threads (just 0.4–0.5 mm in thickness) with 11 threads/cm for one element and 11–12 threads/cm for the other. One of the samples shows a frayed border and loose strands giving a clear view of the even 2/2 woven structure. The use of twill would have required the use of a warp-weighted loom (Broudy, 1979).

A greatest proportion of the textiles implied from Chap 1 include tabby (37%) and repp (42%) weaves (Figure 3), which can also be created on such weaving devices, but more simply could be achieved with a basic ground loom. Most of Chap's tabbies constitute coarse and medium-fine textile structures with 3–11 warp threads/cm and 4–12 weft threads/cm (Figure 3B). Around half of the tabbies show a balanced weave created by an equal weft/warp thread count/cm, even thread thickness and consistent spacing between elements (e.g., Figures 2C,D,G). The remainder are nearly balanced (Figures 2E,F,H). Thread thickness ranges between 0.4 and 1.2 mm for all woven elements, but within individual samples, the thread thicknesses sometimes lack uniformity. The twist across all tabbies is further varied showing hard and loosely twisted yarns among a predominantly Z-twisted thread tradition. However, alternating S and Z twist for warp and weft is present for at least one tabby, giving it a distinct textural appearance (Figure 2D). An additional tabby shows diagonal stitching into the regular tabby structure (Figure 2G). While most tabbies appear to be loom woven (a system of interlacing single thread elements in a 1-over-1-under pattern) at least one print describes an S-plied, twined (hand-woven) textile with the active elements passing over one another in a counter-clockwise direction.

The nearly equal amount of repp textiles (42%) describe fine and very-fine textile structures. If working on the hypothesis that the weft elements are thinner than the warp as outlined in Section 2.4., the repp textiles from Chap 1 are weft-faced (Figures 2I–L, 3B). Repp weave was assigned to samples with twice or more threads than present for their perpendicular counterparts per centimeter square, and a few among the group contain highly

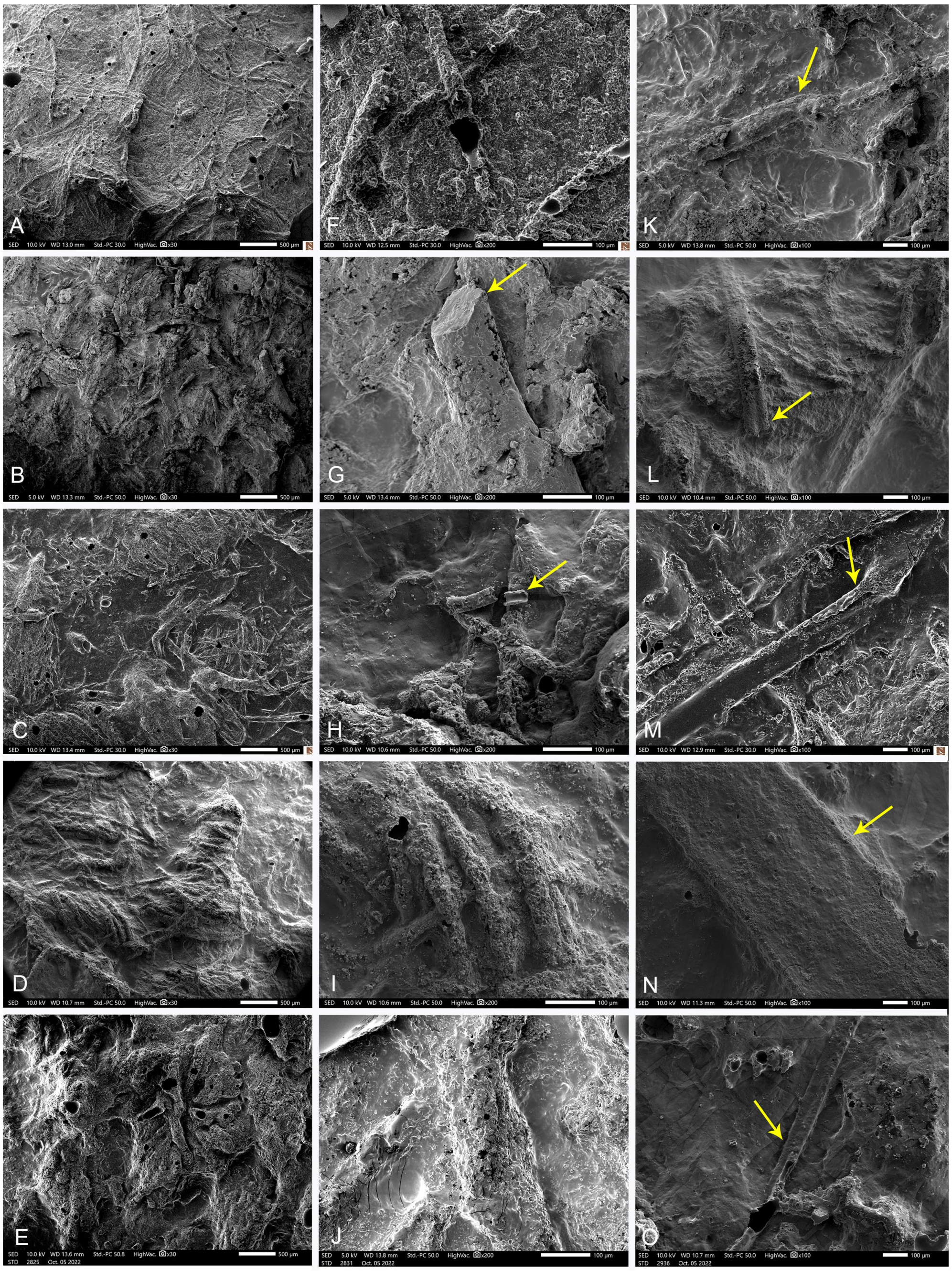

FIGURE 4
Scanning Electron Micrographs of the Chap 1 Textile Pottery. **(A–E)** (×30) include various examples of 'wooly' or 'hairy' textured woven textiles [**A**=repp, **B**=repp, **C**=twined (?) tabby, **D**=repp, **E**=repp]. **(F–J)** (×200) include potential animal fibers implied. Fibers contain the diagnostic cylindrical strands, along with dimensions within the expected values (12–150µ) for primitive wool. **(K–O)** (×100) include potential plant fibers implied. Fibers contain the diagnostic flat/straight and long fibers of bast or other fibrous plants.

compacted wefts that obscure the warp achieving what would have been an extremely dense, warm, and water-resistant cloth (i.e., fine textile structure; Figures 2I,J). Most among the group consist of z-twisted yarn woven in a 1-over-1-under sequence. Others diverge from this basic pattern. One sample shows three weft strands grouped and passed through the warp in an irregular sequence (Figure 2K). In another, a ribbed-effect was created by alternating between compacted wefts and exposed warps (Figure 2L). The thread counts include just 4–12 threads/cm for the warp compared to 11–26 threads/cm for the weft (Figure 3B). Thread thickness ranges between 0.4–1.5 mm for all woven elements, with the warps being notably thicker overall. The regular feature of a compacted weft among the repp textiles restricts our conclusions about the weaving devices employed. While the use of a loom device would have been responsible for several of the implied textiles, at least two Chap 1 samples show crossed elements and an overall diagonal orientation indicative of S-plied, hand twining (Figures 2M,N).

3.2. The raw materials

Some further insight into raw material selection and processing techniques was obtained from the SEM component of the research on the tabby and repp prints viewed at ×30 (Figures 4A–E) and higher to ×100–200 (Figures 4F–O). Fibers range from 12 to 150 µ in diameter (when viewed at ×200) which is consistent with the expected dimensions of primitive sheep fibers (Rast-Eicher, 2016, p. 260, 264) (Figures 4F–J). Even in allowing for shrinkage of the prints as the clay was baked, these dimensions still indicate that the fine, medium and coarse kemp hairs may all have been spun into thread. Unfortunately, examination of the twill impressions with SEM was not able to distinguish sufficient detail of the surface topography nor of the fiber dimensions. We expect that this small yet significant group of prints derive from woolen fabrics, as wool and twill are cited as mutually complementary technologies that together create a warm and strong textile (Gleba, 2012, pp. 3643–3644) and extant twills from Eurasia at this time are woolen (Grömer et al., 2020). Another repeated characteristic of the repp and tabby textiles show 'wooly' or curly looking fibers that stray loose from the parent thread (Figures 4A,C,D). SEM observation of their surface topography at ×200 reveals fibers round in cross-section identifying them as potential animal-derived fibers (Figures 4F–I). The SEM also revealed characteristics in other samples that suggest the pairing of other raw materials in the textiles at Chap 1. A small number of shards inspected with SEM and shown here at ×100 (Figures 4K–O) contain flat/straight fibers that may derive from a bast family of plants which grow wild in the region, or a fragment of grass (e.g., *Achnaterum* sp. still used for yurt and fiber making), reed or sedge which are present in the Chap 2 macrobotanical assemblage (Motuzaite Matuzeviciute et al., 2020b: Table 1). The plant-like fibers are interspersed through what otherwise appear to be woven animal fibers.

4. Discussion

4.1. Textiles from Chap 1: a case for cultural adaptation at high altitudes

Textile-impressed pottery, despite interpretive limitations in the absence of organic material, convey several technical details of an otherwise missing perishable fiber industry from environments with poor preservation. The textile structure, weaving devices employed, thread characteristics, and occasionally raw material identification can also be examined and inferred from the study of textile imprints alone. Building on evidence already obtained from the zooarcheological and material assemblage from Chap 1, its textile pottery permits comprehensive insight into several aspects of local textile traditions in the regional and local social context of high-altitude cultural adaptations. While the agro-pastoral assemblage at settlements within the IAMC are closely comparable, Chap 1 fauna shows proportionally greater numbers of sheep/goat were kept at the site than at lower elevation settlements within its cultural orbit (Ananyevskaya et al., 2020). Warm, breathable, and water-resistant woolen textiles able to both heat and cool the skin (Hu et al., 2020) may have made their way into clothing, shelter, and coverings to superbly shield against the extreme climate present at high altitudes of the Tien Shan.

Furthermore, our examination of Chap 1 textile pottery opens a new (potential) inroad into the question of the category of sheep/goat fibers incorporated into textiles. Sheep and goat have been present in the Fergana Valley from the 6th millennium BC (Taylor et al., 2021) but paleogenomic research is needed to understand the history of mixing among wild and domesticated breeds, their fleece characteristics, and timing of wooly mutations. The dates for Chap 1 fall so much later than this early evidence for domestic caprines in the Fergana valley, hence it may be that the transition to more uniform fleeces did not follow until several thousand years after these animals were present in the region. For Chap 1, the wide range encompassed by diameter values of individual fibers in its textiles, made visible through SEM, are consistent with average values for the coarse outer kemp through to the finer undercoat fibers. Any wool that made it into the Chap textiles appears to derive from primitive sheep that lacked a uniform fleece. Future paleogenomic studies of Central Asian caprine remains will help bring clarity to this hypothesis along with the route such herd animals took, such as through the Eurasian steppes (see Shishlina et al., 2020) or *via* a different route yet undetected. Notwithstanding, animal fibers were not likely the sole raw materials chosen for making textiles at Chap 1. A UAV-based survey in the surrounding Kochkor Valley identified subterranean irrigation canals with possible associations to the 2nd/1st millennium BC use of the site (Rouse et al., 2022) and the macrobotanical assemblage from Chap also contains abundant counts of Cyperaceae *Carex* sp., (sedge) that grows in or near shallow water (Motuzaite Matuzeviciute et al., 2020b: Table 1). Irrigation along the surrounding mountain slopes would facilitate the cultivation of plants for fiber production. Even without irrigation, wild hemp and nettle are naturally occurring plants in this region that also thrive in the micro-spaces of animal pens (Authors' personal observations).

4.2. IAMC and steppe textiles in regional context

Within Eurasia a rich textile assemblage has survived documenting several hundred years of textile evolutions, but twills only appear toward the end of the Bronze Age and long after felt and tabby were commonplace. The small group of twills from Chap 1 add to a geographically dispersed collection of late 2nd/early 1st

millennium BC textiles that are, as far as we know, isolated to agropastoral settlements of the IAMC, Xinjiang's Tarim Basin and surrounding areas (Doumani Dupuy et al., 2018; Wagner et al., 2022) and in Europe (Grömer et al., 2013; Grömer, 2016). By contrast, extensive survey and analysis of Bronze Age textiles and production tools from the steppes of northern Eurasia have failed to expose any evidence for twill (as cited by Glushkova, 2004, p. 227), aside from its appearance on woven bands (Shishlina et al., 2022). This undeniably southern geographic distribution of twills puts the most likely route for the movement of this particularly warm, wooly fabric and associated loom technologies along the IAMC (see Doumani Dupuy et al., 2018; Figure 1; Table 2) and not across the Eurasian steppe belt such as argued recently based on design parallels cited between twill's distinct geometric patterning and considerably earlier ceramics of Eurasian steppe pastoralists (Wagner et al., 2022). Perhaps of relevance here, several years of paleobotanical research of Bronze Age settlement assemblages have demonstrated that the initial dispersal of both Southwest Asian and East Asian crops also circumnavigated the Eurasian steppes, following instead the trail of mountains connecting east and west Eurasia (e.g., Spengler et al., 2014; Motuzaite Matuzeviciute et al., 2022). Future studies should investigate the topic of partner technologies that may have moved in tandem through highland regions in social contexts that supported their adoption and carefully examine how wool might have impacted other areas of visual cultures such as rock art or ceramics (e.g., Wagner et al., 2022).

Nonetheless, most of the Chap 1 textiles are consistent with a more geographically encompassing Central Asian textile tradition that transcends the contrasting social and ecological geographies of its mountains and steppe. This tradition includes various iterations on the basic repp and tabby weaves made on looms or by hand, such as with manual twining or with tablets (see Orfinskaya et al., 1999 for illustrated varieties of such hand-woven textiles). These textile structures repeat technical traditions from much earlier that were carried through into the end of the Bronze age, and later. Details of the technical approaches also transcend vast geographies. For example, the Chap 1 tabbies sometimes repeat characteristics found among northern steppe textiles where textural variations in cloth surfaces were achieved by alternating twist directions and the thickness of woven elements (e.g., Usmanova, 2010; Shishlina et al., 2022). A technique of sewing in surface patterns along the diagonal and the (potential) combination of raw materials (plant and animal fibers) also appears both at Chap 1 and among woolen tabbies of the steppe belt (e.g., Shishlina et al., 2022) and in Xinjiang (personal observation of authors). The raw material and design bricolage detected in this early period carries through into the Iron Age (e.g., Molodin et al., 2009; Hanks, 2010).

Societies who inhabited Chap 1 *ca.* 3,000 years ago drew from various pre-existing/local and mobile textile technologies as they settled down permanently in the Tien Shan's continental climate. Wool, in various iterations, alongside the use of various plants, were important components of the long-term and persistent adaptations that gave way to a highland materiality of fiber-based crafts in this region. The density of its textile weaves too offers particular insight into the added potential benefits of their cloth. The 3,000-year-old textiles from Chap 1 consist of relatively few 'open weaves'. Fine and very-fine repps and tabbies represent the majority weave structure (Figure 3B). Repp textiles provide a denser, and hence potentially more water wicking shield that may have been warmer and more ideal for the extreme cold at higher altitudes of Inner Asia. Future studies of textile pottery throughout the IAMC will address whether this feature is regularly associated with mountain settlements in contrast to the proportion of compact textiles present in other regions of Eurasia.

5. Conclusion

Ethnographic and archaeological studies document the enduring centrality of woolen and other textiles in Central Asian cultural identity, ethnicity, history, technology, and trade. In this regard, we have investigated an aspect of secondary economies in a densely populated biodiverse habitat of the IAMC, which triggered an array of human activities, such as textile production, facilitating the adaptation to high altitude harsh landscapes during the Bronze Age. Perishable materials that underpinned the lifeways of Inner Asian pastoralists and agriculturalists have remained under-documented due to poor organic preservation of extant textiles. However, archaeological investigations at Chap 1 in the Tien Shan Mountains of Kyrgyzstan support the existence of a complex agropastoral subsistence culture with demonstrated long-term settlement in the region's high mountain environments from at least 2,500 BC (Motuzaite Matuzeviciute et al., 2022). Insulating woolen cloth, as well as other breathable plant-based fibers, are an aspect of agropastoralist materiality essential for successful adaptation to the extreme winters and summers in high mountain zones of this landlocked region. What role did textiles play in such adaptations and how might woolen clothing and coverings, along with the important matted woolen felts such as seen on the Central Asian yurt, have facilitated settlement in the extreme climate of Central Asia's high elevation regions deep in the past? We have presented the textile evidence preserved as impressions in its household ceramic assemblage alongside pre-published data on its herd structure and culling practices that indicate wool-focused economies yielded a pastoralist materiality that in many ways continue to define the material and lived experiences of the region's populations today.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

PD wrote the manuscript, performed the analysis in the laboratory, interpreted the data, and created the figures. GM gave written edits to the manuscript draft. GM and KT carried out excavations, performed sample collection and curation of the studied materials. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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