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Cross-Cultural Integration of Solar Terms and Calendars between China and Mongolia: A Perspective from the 24 Solar Terms

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Abstract

By means of literature review, cultural relic verification, and cross-cultural analysis, this paper explores the integration process and inherent logic of the 24 Solar Terms with Mongolian calendars, production practices, and cultural cognition. The study finds that the promulgation of the" Shoushi Calendar" during the Yuan Dynasty initiated the systematic dissemination of solar term culture, and the institutionalized issuance of the" Shixian Book" (Imperial Calendar) in the Qing Dynasty further consolidated the unified framework of temporal cognition. While absorbing the astronomical core of the solar terms, the Mongolian people completed localized innovations through the integration of chronological methods, nomadic-oriented translation of solar term names, and adaptation to production practices, forming a cultural integration feature of "unchanged astronomical core and nomadic-adapted functions."

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Cultural relic evidence and folk proverbs confirm the practical value of solar term knowledge for nomadic migration and production planning, while Tibetan Buddhist calendar charts demonstrate the intermediary role of solar term culture in multi-ethnic exchanges. The research reveals that the 24 Solar Terms, as a cross-cultural link, not only realize the sharing of temporal wisdom between agricultural and nomadic civilizations but also construct a common cultural identity and temporal philosophy of the Chinese nation, providing a typical case for understanding cross-cultural communication.

Keywords: 24 Solar Terms; calendar dissemination; cross-cultural integration.

1. Introduction

Traditionally, the 24 Solar Terms have often been regarded as an exclusive cultural product of the agricultural peoples in the Central Plains (In 2006, the 24 Solar Terms were included in the first batch of national intangible cultural heritage lists as part of traditional Chinese culture; on November 30, 2016, they were inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity). However, numerous documents and studies have shown that the influence of solar term culture has long transcended agricultural regions, deeply integrating into the cultural systems of ethnic groups engaged in nomadism, hunting, and other modes of subsistence. Through absorption, transformation, and re-creation in interactions, it has become a cultural link connecting different ethnic groups. Focusing on the integration of the 24 Solar Terms[1] with the Mongol-Yuan civilization, this paper aims to reveal, by analyzing relevant historical documents, calendar records, and research findings, that the 24 Solar Terms are not unidirectionally disseminated cultural symbols, but rather, in continuous dialogue with the Mongolian people's traditional temporal concepts, calendar systems, and production and living practices, have jointly shaped a shared cognitive framework of time and cultural memory.

2. Preliminary Alignment Between Calendar Systems

Before encountering the systematic calendar of the Central Plains, the Mongolian people and their ancestors possessed their own phenological-based timing system, prior to the 13th century, the Mongolians used a "phenological calendar," where months were named after animal activities or natural phenomena (e.g., "Hoopoe Month," "Cuckoo Month," "Male Antler Month"), and the start of the year might be associated with specific phenological events (such as grass turning green) or astronomical phenomena (such as the rising of the Pleiades star cluster), rather than being fixed to the first month of the Central Plains calendar[2]. This calendar was closely aligned with the production rhythms of grassland nomadism. The contact and integration between the two calendar systems became prominent and institutionalized during the Mongol-Yuan period.

2.1 Introduction and Translation of Official Calendars

After the establishment of the Yuan Dynasty, to meet the needs of national governance and daily life, Kublai Khan ordered the promulgation of the Shoushi Calendar (Season-Granting Calendar). Named by Kublai Khan himself, the calendar derives from the ancient saying "respectfully instructing the people on time," and its original title was Shoushi Lijing (Complete Treatise on the Season-Granting Calendar). Compiled under the leadership of Xu Heng, Director of the Imperial Observatory, with Guo Shoujing and Wang Xun as deputies, the

calendar determined the tropical year as 365.2425 days, differing from the modern observed value of 365.2422 by only 25.92 seconds. It achieved the same precision as the Gregorian calendar but predated the introduction of the "Gregorian Calendar" in the Ming Dynasty by over 300 years. Through this official text, the 24 Solar Terms calendar was systematically presented to the Mongolian ruling class and people for the first time. Historically, it was not only the most advanced calendar in the world at that time but also an important medium for introducing the systematic knowledge of the 24 Solar Terms into Mongolian culture. It can be said that the Shoushi Calendar represented the highest achievement in calendar-making worldwide during its era. The authors in [3] noted that the Yuan Dynasty not only promulgated Chinese and Huihui calendars but also organized the translation of the Mongolian version of the Shoushi Calendar[3], which was widely implemented across the empire. This marked the first time that the Chinese lunisolar calendar system, centered on the 24 Solar Terms as solar coordinates, was systematically presented to the Mongolian ruling class and part of the people in the form of an official text. Facts have proven that the Shoushi Calendar stood the test of time. It was used in China for over 300 years and exerted a significant influence. Korea and Vietnam also adopted the Shoushi Calendar at one point.

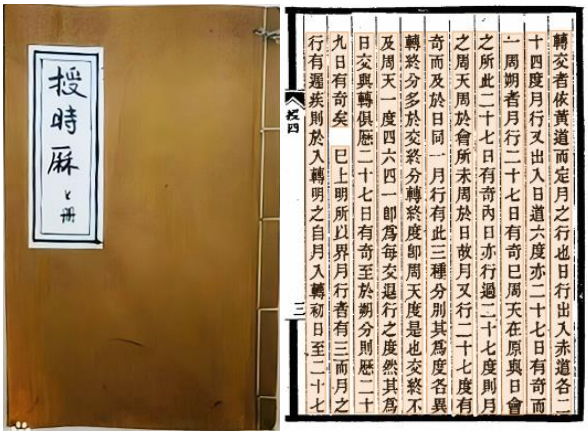


Figure 1: “Shou Shi Calendar

2.2 Integration of Chronological Methods

The Mongolians traditionally used the Chinese zodiac for chronological recording. In the process of absorbing the Central Plains calendar, they creatively integrated the Heavenly Stems, Five Elements, and color concepts of the Central Plains to form a unique chronological system. The authors in [5] has found that the Tibetan calendar uses the Five Elements (wood, fire, earth, metal, water) divided into yin and yang to represent the Ten Heavenly Stems, while the Mongolian calendar uses five colors (blue, red, yellow, white, black) divided into light and dark shades for the same purpose. Meanwhile, the Mongolian calendar also incorporated the "Victorious Birth Cycle" chronological method from the Tibetan Kalachakra calendar, which was introduced to Tibet from India[4]. This integration reflects the Mongolian people’s active adaptation and localized transformation of foreign calendar elements.

2.3 Emergence of the "Hor Month"

Studies have shown that the "Hor Month" lunar system (with the Yin month as the first month and the full moon fixed on the 15th day) essentially originated from the "Xia Zheng" (Xia Dynasty calendar) of the Central Plains. This lunar system was introduced to Tibet by the Mongolians during the Yuan Dynasty and adopted by the Tibetan calendar, hence the name "Hor Month" (Hor referring to the Mongolians). This clearly indicates that the Mongolians played a crucial intermediary role in the dissemination of the Central Plains calendar to Tibet.

3. Institutionalized Calendar Issuance and Establishment of a Common Temporal Framework

The Qing Dynasty marked an institutionalized and deepened period of integration between the 24 Solar Terms and Mongolian culture. Existing research has thoroughly elaborated on the Qing dynasty's systematic issuance of the "Shixian Book" (an imperial calendar including the 24 solar terms) to the Mongolian region, as well as its political and cultural significance:

3.1 Calendar Issuance Rituals

Compiled by the Imperial Observatory, the Qing court annually issued the Shixian Shu in three languages (Manchu, Mongolian, and Chinese) to the emperor, empress and concubines, imperial clansmen and princes, Mongolian officials in the capital, and various leagues and banners of Inner Mongolia, Outer Mongolia, and Western Mongolia. Initially, the calendars were brought back by Mongolian envoys during their annual tribute missions; later, they were delivered through the postal system of the Lifanyuan (Board of Colonial Affairs), with a fixed quota of 100 copies per banner. This system, initiated during the Kangxi reign, expanded to Mongolian tribes in Khalkha, Qinghai, Xinjiang, and other regions as the empire’s territory grew.

3.2 Political and Cultural Symbolism

"Accepting the imperial calendar" was an important ritual in ancient Chinese dynasties to demonstrate political suzerainty and cultural identity. The Qing court’s issuance of the Shixian Shu containing the 24 Solar Terms to Mongolian regions was not only a practical temporal service but also a symbolic measure to incorporate Mongolian regions into the national unified time management system and political-cultural order. It marked the formal alignment of Mongolian temporal cognition with the national framework.

3.3 Localization of Content

The Mongolian version of the Shixian Shu issued by the Qing court was not a mere translation. To adapt to the vast Mongolian regions, the Imperial Observatory added the times of sunrise, sunset, and solar terms for various Mongolian localities (such as Uliastai, Kobdo, Yili) to the calendar. This adjustment reflected the central government’s respect for local natural conditions, enabling solar term knowledge to more effectively guide local production and daily life.

4. Research Materials

This study uses cultural relic evidence provided by Mongolian private collectors to confirm the dissemination and localized transformation of the 24 Solar Terms in Mongolian regions (see Figures 2):

Figure 2： Монгол календарь / Хувийн цуглуулга / Badral's privat collection

These are Tibetan Buddhist calendar charts used in Mongolian regions during the Qing Dynasty, integrating astronomical calculation, religious symbolism, and agricultural-pastoral guidance functions. They are physical evidence of multi-ethnic cultural exchange and have a direct connection with the 24 Solar Terms. In terms of textual characteristics, the charts are entirely in Tibetan: for example, the Chinese zodiac is marked in Tibetan around the circle (e.g., "གཡང་ལོང་" corresponding to "Dragon"), along with Tibetan numerals and calendar terms (such as "ཟླ་བ" [month], "ཚེས་" [day]). There is no Mongolian or Chinese text, thus excluding the possibility of them being Mongolian or traditional Chinese calendar charts. In terms of calendar structure, they adopt a circular hierarchical design with concentric circles, including inner time scales, middle Five Elements/zodiac signs, and outer Tibetan annotations, conforming to the Tibetan calendar system of "Five Elements, zodiac signs, Heavenly Stems, and Earthly Branches." Some charts feature segment markers similar to the Central Plains' 24 Solar Terms, but the names are Tibetan transliterations or free translations, and the colored blocks may represent important Tibetan calendar nodes, incorporating adaptive adjustments to the plateau climate.

From a historical perspective, Tibetan Buddhism was introduced to Mongolia during the Yuan Dynasty, and the Tibetan calendar became one of the official calendars in the Qing Dynasty. The Qing court issued versions of the Shixian Shu containing the Tibetan calendar to Mongolian regions. Based on official records of this activity, it is reasonable to infer that these charts date from the late 18th to the early 20th century. The yellowed paper, worn edges, and mineral-based red pigment (presumably cinnabar) are consistent with the characteristics of

handwritten copies from the late Qing Dynasty to the early Republic of China. The neat and fluent Tibetan calligraphy, without modern printing traces, suggests they are handwritten copies from Mongolian regions during the 18th–20th centuries, possibly used for astronomical and calendar teaching in temples or aristocratic families, with application scenarios including religious rituals, administrative management, and nomadic production guidance. Compared with the Central Plains' 24 Solar Terms, although some concepts were integrated, localized transformations were made through the Tibetan calendar system, such as adjusting solar term dates, adopting Tibetan annotations, and incorporating Five Elements and zodiac elements. Figure 3 is closest to a standard Tibetan calendar compass, with the outer layer divided into 24 Solar Terms segments, the middle layer representing the Five Elements, and the inner layer denoting Heavenly Stems, Earthly Branches, and zodiac signs; Figure 2 is a simplified version, possibly used for quickly checking the correspondence between months and solar terms; Figures 4 feature bright colors, with block divisions potentially related to the Tibetan calendar's "full moon" and "new moon," and red symbolizing the fire element. Overall, these cultural relics are physical evidence of multi-ethnic cultural exchange, reflecting how Tibetan Buddhism integrated Central Plains astronomical knowledge with local traditions during its dissemination in Mongolia, forming a unique calendar culture and serving as a typical example of the cross-cultural communication of the 24 Solar Terms.Ancient peoples' worship and belief in nature are universal across different cultural backgrounds. There is a rock painting in Ge'er Aobao Gou of the Yinshan Mountains depicting a shaman worshiping the sun: a figure with hands clasped above the head, as if paying homage to the sun high in the sky. This reflects both reverence and dependence on the sun, as well as the mystery and awe arising from ignorance of the sun's movement laws. "Because this reverence gradually developed into attention and observation; to grasp the laws of grass growth and withering and the reproduction of livestock, nomads subsequently created rock paintings of celestial bodies such as the sun, moon, stars, and nebulae, as well as handprints, footprints, and hoof prints related to primitive worship[5]." Similarly, ancient peoples in agricultural civilizations summarized and discovered the laws of the sun's movement, transforming sun worship into depictions of the sun and creating a series of sun patterns (see Figures 3). Through accumulated experience, they further developed systematic astronomical knowledge and practical systems—namely, the 24 Solar Terms, the subject of this discussion. The calendar charts clearly show the division of things through eight-pointed star patterns (see Figure 3), thus interestingly connecting the differences and similarities between nomadic and agricultural civilizations through rock paintings and patterns featuring human figures and sun motifs.

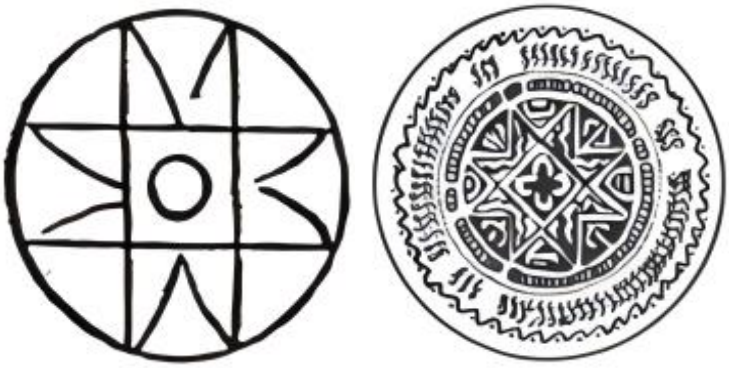


Figure 3: Sun Patterns

5. In-depth Integration of Production Practices and Cultural Cognition

The integration of the 24 Solar Terms with Mongolian culture is more profoundly reflected in the guidance and localized interpretation of nomadic production laws.

5.1 Guiding Nomadic Migration

Nomadic peoples have developed sophisticated migration systems based on natural rhythms[6]. The Mongolian proverb "When White Dew falls, grass turns yellow; when Frost's Descent arrives, move to pastures" is a localized application of solar term knowledge, guiding seasonal migration to ensure livestock access to optimal pastures[7]. Building on the absorption of solar term concepts, the Kazakh people have even developed a unique nomadic-specific "Amar" solar term system[8]. Solar terms have thus become an important knowledge tool for coordinating humans, livestock, and seasonal changes in nature.

5.2 Enriching Ethnic Literature and Knowledge Systems

Calendar exchange is bidirectional[9]. The authors in [2,4] noted that there are complex mutual influences between Chinese, Mongolian, and Tibetan calendars. For example, Mongolian and Tibetan documents preserve unique records and debates on chronological methods (such as research on the compilation date of The Secret History of the Mongols), revealing the continuous exchange and joint creation of astronomical and calendar knowledge among various ethnic groups. Meanwhile, ancient books of the Yi people, such as On the Universe and Humanity, also preserve ancient knowledge of the 24 Solar Terms, indicating that early Chinese astronomical and calendar information may have been preserved and enriched across multiple ethnic cultures.

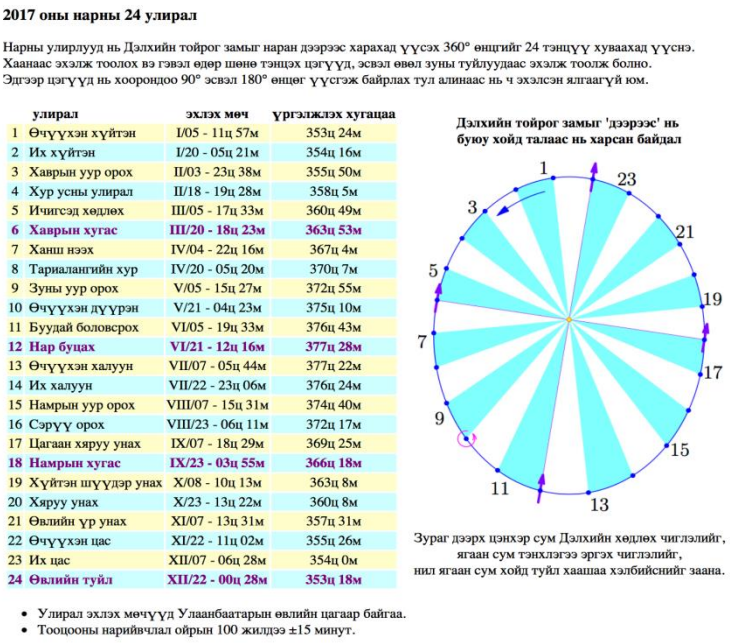
5.3 Constructing Cultural Identity

The 24 Solar Terms "carry the shared life memories of multiple ethnic groups in China," and their inherent "shared emotional experiences, life experiences, and cognitive concepts" have become an important cultural practice for forging a sense of community among the Chinese nation. The designation of some solar term days as national statutory holidays by the state is an initiative to strengthen this shared temporal experience and cultural identity in the modern context.

6. Localization of the 24 Solar Terms in Mongolia: Unity of Astronomical Core and Nomadic Adaptation

The 2017 Mongolian-language 24 Solar Terms chart (see Figure 7) clearly reflects its localized characteristics of "taking astronomical observation as the core and adapting to nomadic production": it retains the astronomical logic of the Chinese 24 Solar Terms (dividing one node every 15° of the sun's ecliptic longitude, with complete correspondence to the ecliptic longitude data in the circular chart on the right), but translates solar term names into expressions aligned with nomadic life—for example, the Chinese term "Xiaoman" (Grain Buds) is translated as "Хамн нах" (Grass Gradually Thrives), and "Mangzhong" (Grain in Ear) as "Тараалангийн хур" (Sowing Season), transforming agricultural-oriented names into natural cognitions of "grass growth and sowing" in Mongolian nomadic civilization. Meanwhile, the Gregorian dates marked in the table provide a temporal

reference for nomadic "migration and forage storage," achieving localized integration characterized by "unchanged astronomical core and nomadic-adapted production functions."



2017 оны нарны 24 улирал

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	улирал	эхлэх мөч	үргэлжлэх хугацаа
1	Өчүүхэн хүйтэн	I/05 - 11ц 57м	353ц 24м
2	Их хүйтэн	I/20 - 05ц 21м	354ц 16м
3	Хаврын уур орох	II/03 - 23ц 38м	355ц 50м
4	Хур усны улирал	II/18 - 19ц 28м	358ц 5м
5	Ичигсэд хөдлөх	III/05 - 17ц 33м	360ц 49м
6	**Хаврын хугас**	**III/20 - 18ц 23м**	**363ц 53м**
7	Ханш нээх	IV/04 - 22ц 16м	367ц 4м
8	Тариалангийн хур	IV/20 - 05ц 20м	370ц 7м
9	Зуны уур орох	V/05 - 15ц 27м	372ц 55м
10	Өчүүхэн дүүрэн	V/21 - 04ц 23м	375ц 10м
11	Буудай боловсрох	VI/05 - 19ц 33м	376ц 43м
12	**Нар буцах**	**VI/21 - 12ц 16м**	**377ц 28м**
13	Өчүүхэн халуун	VII/07 - 05ц 44м	377ц 22м
14	Их халуун	VII/22 - 23ц 06м	376ц 24м
15	Намрын уур орох	VIII/07 - 15ц 31м	374ц 40м
16	Сэрүү орох	VIII/23 - 06ц 11м	372ц 17м
17	Цагаан хяруу унах	IX/07 - 18ц 29м	369ц 25м
18	**Намрын хугас**	**IX/23 - 03ц 55м**	**366ц 18м**
19	Хүйтэн шүүдэр унах	X/08 - 10ц 13м	363ц 8м
20	Хяруу унах	X/23 - 13ц 22м	360ц 8м
21	Өвлийн үр унах	XI/07 - 13ц 31м	357ц 31м
22	Өчүүхэн цас	XI/22 - 11ц 02м	355ц 26м
23	Их цас	XII/07 - 06ц 28м	354ц 0м
24	**Өвлийн туйл**	**XII/22 - 00ц 28м**	**353ц 18м**

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Figures 4: Mongolian 24 Solar Terms Calendar

7. Discussion

This section further explains the significance of the findings and compares them with previous related studies. The findings of this study provide further insights into the cross-cultural integration of solar terms and calendars between China and Mongolia. The results suggest that historical, cultural, and environmental factors jointly influenced the formation and adaptation of calendrical systems. These findings help clarify how shared agricultural practices and cultural exchanges contributed to similarities and differences between the two systems.

The results of this study are generally consistent with previous research that highlights the importance of cultural exchange in the development of traditional calendar systems. For example, earlier studies have emphasized the role of astronomical knowledge and seasonal observations in shaping solar terms. Compared with these studies, the present research further emphasizes the intercultural transmission mechanisms between China and Mongolia, providing a broader comparative perspective.

8.Limitations of the Study

Although this study provides meaningful insights into the cross-cultural integration of solar terms and calendars between China and Mongolia, several limitations should be acknowledged.

First, the analysis is mainly based on available historical documents and literature, which may not fully

represent all regional or temporal variations. Second, due to limitations in data availability, some interpretations may require further empirical validation in future studies. Finally, this study focuses on a comparative cultural perspective, and future research may benefit from incorporating quantitative methods or broader geographic samples to strengthen the findings.

9.Conclusion

The 24 Solar Terms as a Cross-Cultural Link and Symbol of Community

The integration of the 24 Solar Terms with Mongolian culture has a long historical origin, with pathways including the official promulgation and translation of calendars, academic exchange and knowledge sharing among scholars, and empirical adaptation and absorption based on folk production practices. This process is one of bidirectional construction and localized innovation: it is not a simple cultural transplantation, but a mutual construction. The solar term system of the Central Plains provided the Mongolian people with a more precise tropical year framework and a unified national temporal reference; meanwhile, based on the geographical and climatic characteristics of the plateau grasslands and their nomadic production mode, the Mongolian people innovated the interpretation, emphasis, and application of solar terms, which in turn influenced the development of other ethnic calendars such as the Tibetan calendar (e.g., the "Hor Month").

The exchange of the 24 Solar Terms transcends the differences between agricultural and nomadic modes of subsistence. Evolving from a practical "natural temporal guide," it has risen to become a shared "humanistic temporal rhythm" and cultural cadence among various ethnic groups. Therefore, the dissemination and integration of the 24 Solar Terms between the Central Plains and Mongolia is a vivid case of cross-cultural communication within Chinese civilization. It demonstrates the dynamic formation process of the "pluralistic unity" pattern of Chinese culture: while preserving the unique cultural characteristics of each ethnic group, continuous interaction and integration have fostered a shared, high-level cultural identity and temporal philosophy. This historical experience holds important enlightenment for understanding the inclusiveness and vitality of Chinese culture, as well as for reflecting on the protection and inheritance of intangible cultural heritage in the global context.

10.Funding

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