

## First ancient cultivated rice discovered in Central Asia

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Rice has always been the most important food in Asia and the world. About half of the population on earth use rice as their main food source. The origin, spread, evolution, and ecological adaptation of cultivated rice are still one of the most important issues which currently concerned by global archaeologists, biologists, and agricultural scientists.



In recent years, archaeobotany and molecular biology studies have shown the originally cultivated <u>rice</u> was domesticated into japonica rice (Oryza sativa japonica) in the lower Yangtze region, China, 10000 years ago, then spread to Japan, South and Southeast Asia. About 5000-4000 years ago, the cultivated japonica rice spread to South Asia, hybridized with the native wild rice, gradually form the indica rice (Oryza sativa indica) and become the main crop in South Asia today.

However, in recent years, research on the origin and spread of rice has mainly focused on East Asia, Southeast Asia, and South Asia. At present, we still know very little about when and how rice spread into West Asia, Europe, and Africa. The Central Asia region, as an important node in the ancient Silk Road cannot be ignored, because it is the "crossroads" of world civilization. Therefore, studying the time and location of rice emergence in Central Asia can help us gain insight into the spreading process of rice agriculture and adds an important element to early crop globalization research.





Satellite imagery of Khalchayan and surface remains within the site. Credit: Chen Guanhan and Zhou Xinying, IVPP





Macrobotanical remains from the Khalchayan site. 1-2: Oryza sativa; 3: Hordeum vulgare; 4: Triticum aestvum; 5: Pisum sativum; 6: Lens culinaris; 7-8: Linum usitatissimum; 9: Lithospermum arvense; 10-12: Setaria italica; 13-15: Chenopodium sp.; 16-18: Polygonum sp.; 19-20: Galium aparine; 21-22: Alhagi sparsifolia. Credit: Chen Guanhan, IVPP





Comparison of Morphological Data from Ancient Rice and Modern Rice in China and South Asia. Credit: Chen Guanhan, IVPP

Recently, Li Xiaoqiang's research group at the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences (IVPP, CAS) and other researchers in College of Cultural Heritage, Northwest University, China, Institute of Archaeology, Uzbekistan Academy of Sciences reported their latest research about the agricultural remains at the Khalchayan site in Uzbekistan, which was published in *Science China Earth Science*. Researchers investigated 11 sites on the northern bank of the Amu Darya from the Bronze Age to the Arabian period and found carbonized rice remains at the Kalchayan site. With archaeobotany and chronology methods and other local archaeological records, researchers provide new physical evidence for the spread of rice to western Asia and the exchange of eastern and western civilizations along the ancient Silk Road.



Khalchayan site is a city site in southeastern Uzbekistan. Researchers used the flotation method to obtain large amount of botanical materials at a cultural layer in the southwest part of the site. The AMS <sup>14</sup>C dating results showed that the age of the rice remains in the site are 1714-1756 cal. B.P., which is in Kushan period. In addition to the rice remains, carbonized wheat, two-row barley, pea, millet, grapes, flax and other crops were recovered at the site. These crops are of both West Asian and East Asian origin, which illustrates a diverse and complex oasis farming system. Because rice cultivation requires more heat and water than wheat and millet, this makes it difficult to cultivate in arid regions in early times. But combining the carbonized rice remains with the records of the irrigation systems existing in other local oases at agricultural archeological sites during Kushan period, researchers believe there is the possibility of cultivation of rice locally during that time.

Morphological studies show that the carbonized rice remains are japonica rice, and their morphology is similar to the remains found in some sites in southern China and northwestern India during the same period. That indicates the possibility of rice in Central Asia was spread from South Asia. Meanwhile, when rice appeared in Central Asia, the Kushan Empire has already established in northwest India and conquered most parts of Central and South Asia. The imperial expansion and political unrest may have further fueled the dispersal of crops across Inner Asia. The emergence of rice may also indicate the beginning of the rice-based diet culture's gradual integration with the local wheat-based diet system in Central Asia and finally forms the Central Asia diet system of today—e.g., baked dough (Naan), pilaf and barbecue.

The rice remains at the Khalchayan site are the first well reported rice remains in Central Asia. They are also one of the few ancient cultivated rice examples found outside East Asia, South Asia and Southeast Asia. This discovery has great value for further understanding the exchange process of the early agricultural activities in the Southern Himalayan



route, and also provides new evidence to explain how rice further spreads westward to Iran, Europe, and Africa, where <u>rice cultivation</u> activities exist today.

**More information:** Guanhan Chen et al, Kushan Period rice in the Amu Darya Basin: Evidence for prehistoric exchange along the southern Himalaya, *Science China Earth Sciences* (2020). DOI: 10.1007/s11430-019-9585-2

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