Archeobotanical Study of Neolithic Sites in China Sheds Light on the Origins of Lacquer and Tea Use

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[Background]
The lower Yangtze valley in China is a treasure house of archeological ecofacts, since the wetland environment of the area enabled the preservation of many organic remains, as seen at the famous Hemudu site. We organized a project team in cooperation with Chinese archaeologists and enlisted the help of experts in botany, agriculture and other palaeoenvironment-related sciences. Our focus is on the history, especially the origins of plant use by the prehistoric people.

[Results]
The earliest example of lacquer ware in China is said to be a lacquered bowl found at the Hemudu site. However, this supposition is not based on scientific analysis. We analyzed a lacquer fragment of a wooden cylindrical tube excavated from the lower stratum of the Tianluoshan site, which is dated to the same period as the Hemudu site (about 7000 years ago), through infrared spectroscopy and microscopic observation. We found that three layers of lacquer had been applied to the tube. Our analyses also showed that lacquer had been applied to a wooden bow (Fig.1) found at the Kuahuqiao site, dated about 1000 years earlier than Hemudu and Tianluoshan. At present, this is the oldest scientifically dated example of lacquer use in East Asia.

Another important discovery is a possible tea planting found in the middle stratum of the site. Roots were unearthed from two locations, where more than ten roots were arranged in rows respectively (Fig. 2). Microscopic examination could determine only that they were of the genus Camellia; but because the wood structure is similar to that of modern tea plants and their archaeological context clearly indicates artificial planting, we concluded that they were probably tea trees. The carbon-14 date of one sample by accelerator mass spectrometry is 3526-3366 BC with an 87.7 percent possibility. In other words, cultivation of tea may have begun in the lower Yangtze region about 5400 years ago. We are continuing our study of the remains to see whether DNA analysis can identify them as tea trees.

[Outlook]
Our research also covers many other fields such as reconstruction of palaeoenvironment through pollen and diatom analyses, morphological identification of animal bones and plant seeds (Fig.3), and isotopic analysis of human bones that can provide clues about diet. We hope to integrate the results of these studies to reconstruct the way of life of the early rice-farming cultures in Asia.

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Fig. 1: Lacquered bow found at Kuahuqiao site

Fig. 2: Excavation of possible tea plant root at Tianluoshan site

Fig. 3: Carbonized rice grains from Tianluoshan site

Related Grants-in-Aid for Scientific Research:
FY2003-2005 Grant-in-Aid for Scientific Research (B): "Archaeobotanical Research on the Neolithic Cultures of the Lower Yangtze Region"
FY2006-2009 Grant-in-Aid for Scientific Research (A): "Reconstructing Hemudu Culture Studies: A Comprehensive Interdisciplinary Research of Tianluoshan Site in Yuyao, Zhejiang, China"