

# Anthracology from the Far East: a case study from the upper Ying valley (Henan province, China)

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**Summary:** *The aim of this work is to present a short history of charcoal studies in China and the results from the anthracological study of different samples from the upper Ying valley including sites from different chronologies and deposits. The materials under study come from sites dating from the Yangshao to the Erlitou phase. The study shows that the most important and present in all samples is Quercus ssp. deciduous. The rest of the taxa are only present in some samples showing the variability of the assemblage: Ziziphus/Paliurus, cf. Phyllostachys, Cotinus/Rhus, Melia, Morus, Pinus, Prunus. In the record there are elements from the oak forest composed by different oak species and other shrubs or trees that were exploited for firewood.*

**Key words:** *Chinese anthracology, landscape, firewood management, oaks*

## INTRODUCTION

The background of Chinese anthracology is still very limited considering methodology and general results. In China, the first evidence of charcoal analysis dates from 1954. Gu (1957) identified the anatomical structure of a natural charcoal fragment in the Changbai Mountain. However, charcoal analysis in archaeological sites began at the end of the 20th century. In 2002, Cui (Cui *et al.*, 2002), on the basis of the analyses of charcoal fragments from Dadianzi and Halihaitu sites (Bronze Age) proposed vegetation reconstruction. Furthermore, Wang *et al.* (2002) studied the wood exploitation of ancient populations using charcoal analysis and analyzed quantitatively the climate and the environment. In addition, Wang *et al.* (2004) introduced anthracology applied to archaeological sites. From that point onwards, charcoal from archaeological sites has been analyzed in order to study former ecosystems, assess changes in vegetation communities over time, recognize the effect of human activities on plants and extract information on wood exploitation (see Wang *et al.*, 2004, 2005, 2011; Wang and Wang, 2007).

In this work we present the anthracological study of different samples from the upper Ying valley including sites from different chronologies and deposits. The upper Ying valley is an alluvial basin in the Henan province, bordered by the Luoyang basin to the northwest, within China's central plain. The Ying River flows west to east, surrounded by the Songshan Mountains to the north and the Jishan Mountains to the south (Zhang *et al.*, 2010). The local chronology in this region is based on both ceramic typology and radiocarbon dating which, in combination, suggest three broad archaeological divisions: a late Neolithic 'Yangshao' phase (*ca.* 4000–2500 BC), a transitional 'Longshan' phase (*ca.* 2500–1800 BC) and an early

Bronze Age 'Erlitou' phase (*ca.* 1800–1600 BC) (Zhang *et al.*, 2010).

## RESULTS

The materials under study come from the bucket flotation of 15 samples from 8 sites (GSH, SHD, WAD, WWW, XFD, XIW, YFT and YUQ). Identification of the charcoal fragments was done on the basis of different wood anatomy atlases. In general the samples were poor and some of them only provided few charcoal fragments. The study of 310 charcoal fragments has yielded 10 different taxa distributed among the different samples (Table 1). The most important taxon and present in all samples is *Quercus* sp. deciduous. The rest of the taxa are only present in some samples being *Ziziphus/Paliurus* the most important among them. Other taxa are cf. *Phyllostachys*, *Cotinus/Rhus*, *Melia*, *Morus*, *Pinus*, *Prunus*.

The different periods show similar patterns being *Quercus* the most important taxon. Moreover, the largest sample shows the largest variability corresponding to the Late Longshan period. Therefore we consider that it would be necessary to study a larger amount of charcoals to view the relative differences among samples.

## DISCUSSION

The obtained dataset from the Ying valley suggests the presence of species from broad-leaved forests dominated by oaks. In the record there are elements from the oak forest composed by different oak species and other shrubs or trees. Environmental studies of different types of sequences show that during the first phases of the Holocene there was an important forest cover (Cui *et al.*, 2002; Guanglan *et al.*, 2005; Ren, 2007; Itzstein-Davey *et al.*, 2007). According to these

authors, the main forests grew under favourable climatic conditions. Their evolution and transformation seem to be in relation with the intensification of human activities. Moreover some changes in the general environment involve oscillations in humidity rates. The formation processes of the assemblages from the Ying valley are the result of rubbish accumulations in pit structures. Therefore the origin of this charcoal could be wastes of fuel wood and/or wastes of other activities (agriculture, wood construction, objects). The importance of oaks in these assemblages permits to suggest the exploitation of these taxa in an organized society. Fruit producers such as jujube, plums, mulberries, china berries, are also present in the charcoal assemblage. In this sense we remark the absence of acorns and on the contrary the abundance of oaks in the charcoal assemblage. Furthermore, the difference in percentages between the most important taxa in the assemblage and the rest of the taxa is significant. The distribution of taxa suggests a managed and organized exploitation of certain species or forests.

Taxa	Periods			
	Yanshao	Early Longshan	Late Longshan	Erlitou
<i>Cotinus/Rhus</i>			3	
Fagaceae	3		1	1
Lauraceae			1	
<i>Melia azedarach</i>			3	
<i>Morus</i>	1		5	1
<i>Morus/Melia</i>			2	
<i>Pinus</i>	3			
<i>Prunus</i>			1	
<i>Quercus</i>	8	4	18	6
<i>Quercus</i> sp. deciduous	54	7	122	4
<i>Quercus/Castanopsis</i>	1	1	2	
<i>Ziziphus/Paliurus</i>	2	3	9	
cf. <i>Phyllostachys</i>			9	
cf. Anacardiaceae			2	
cf. <i>Melia</i>				2
cf. <i>Quercus</i>			1	
cf. <i>Rhus</i>			1	
cf. <i>Vitex</i>			1	
cf. <i>Ziziphus</i>		2		
Angiosperm	2	7	15	1
<b>Total</b>	<b>74</b>	<b>24</b>	<b>196</b>	<b>15</b>

TABLE 1. Results from the charcoal analyses from the Ying valley by periods.

## CONCLUSION

On the basis of the anthracological analyses from these sites we can conclude that: 1) the landscape was dominated by oak forests and firewood management was directed to the use of oaks as the main species; 2) a larger sample should be studied in order to assess the degree of transformation of the forest during these periods as well as to determine forest management patterns; 3) Chinese anthracology is starting to spread since the end of the last century onwards and the study of more sequences from other areas and periods will permit in the future to understand the complexity of environmental and cultural changes in this vast region.

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