Veget Hist Archaeobot (1999) 8:31–34

Vegetation History and Archaeobotany

Finger Millet Processing in East Africa

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Received June 8, 1998 / Accepted November 3, 1998

Abstract. Although archaeobotanical sampling and recovery programmes are a relatively recent implementation in East African archaeology, results from sites where they have been carried out follow a similar trend. This is one of abundant recovery of wood charcoal, but very little in the way of other macroscopic plant remains. Restricted archaeological evidence and ethnographic interviews show the importance of grains, in particular finger millet (*Eleusine coracana*), for the Bunyoro people of Uganda in pre-colonial times. It has been suggested that one of the possible reasons why finger millet is not being recovered in quantity from archaeological contexts is because the processing of this crop does not involve heating and hence there is not the chance of being deposited in charred form in the archaeological record. Recent ethnographic work on finger millet processing in Uganda shows that it is exposed to heat and potential charring during cleaning and preparation of the grain for either storage or cooking, and this regime is discussed in terms of its activities and products. These findings reinforce the need for archaeobotanists and archaeologists working in this region to look for other possible causes of the scarcity of macroscopic plant remains, and also the importance of considering integrated evidence for agricultural activity on prehistoric sites.

Key Words: Ethnobotany – Finger Millet – Crop Processing – Charring – East Africa

Introduction

Archaeology in East Africa has largely concentrated on the study of human origins; only with the work of Posnansky (1966), Sutton (1986) and Robertshaw (1990), among others, have questions relating to the more recent past in this area begun to be explored. In particular, aspects of social organisation and the spread and development of iron technology are increasing research interests. The roles of both pastoralism and agriculture within the social and cultural groups of the region has been recognised as important to understanding this spread and development, and they have been the focus of directed research through the study of field systems (Sutton 1986) and faunal remains (Marshall 1990). However, within this relatively new area of study, the potential of archaeobotany itself and the detailed information it can provide for the understanding of the plant based subsistence, has led to archaeobotanical sampling and retrieval programmes being carried out on a number of sites. The results from these programmes have been, almost without exception, very disappointing. Whilst ubiquitous wood charcoal has been noted from all the sites, there has been very little in the way of recovered macroscopic plant remains, and even less in the way of recovered and identified cereal remains.

The situation of cereal agriculture studies in East Africa

Ethnobotanical work carried out in 1995 in Uganda stressed the importance of both cereals in recent prehistoric (i.e. pre-colonial) and historic times (Young 1996; Young and Thompson 1998). In particular, finger millet was the "status" food of the Bunyoro people - the food of royalty and the food to give to respected visitors. It was also prized for its capacity to be stored for up to five years in underground pits.

Excavation in Uganda has also uncovered other archaeological indicators of agriculture, such as grindstones and iron knife blades, similar to those used for harvesting today. At the Iron Age sites of Munsa, excavated in 1995, and Kasunga, excavated in 1997, more than one hundred stones interpreted as grindstones were recovered, and other tangential evidence for agriculture has also been excavated at other sites (Robertshaw et al. 1997; Robertshaw 1997). The presence and importance of cereals, in particular finger millet (*Eleusine coracana*) and sorghum (*Sorghum bicolor*) is also known through the study of plant genetics (Harlan 1992; Possehl 1997). In contrast there is a noted absence of macroscopic plant remains, and in particular, cereals.

There is, obviously, a range of possible reasons for this lack of macroscopic plant remains, including various factors. The first is that sampling and retrieval programmes are of sufficient scale on archaeological sites. Six sites where sampling has been undertaken, with only limited results will be briefly summarised here. Gogo Falls, Kenya (Wetterstrom 1991), where 350 flotation samples were taken, from which 400 items recovered, less than half of which could be identified. Deloraine, Kenya (Ambrose 1984) where nine seeds were recovered from archaeological levels after sampling, only one of which was charred. Kibiro, Uganda (Connah 1991) where no direct evidence for plant based subsistence was recovered, despite sampling for plant material. Ngamuriak, Kenya (Robertshaw 1991) where sampling for plant remains and flotation failed to produce plant remains in significant quantities. Ntusi, Uganda (Reid 1997) small quantities of charred grains were recovered. Sixth, at Munsa, Uganda (Robertshaw 1997; Young & Thompson unpublished) an extensive sampling and retrieval programme from over 350 contexts was carried out, producing no cereal remains, and very little in the way of other plant material, with the exception of wood charcoal.

The second factor is that the inhabitants of the sites under investigation were not eating cereals on a regular basis.

The third is that the sites investigated do not include processing areas for agricultural products - this relates to questions of interpreted site function.

The fourth is that in the humid tropics, repeated wetting and drying cycles may be the cause of the mechanical disintegration or loss of small, brittle pieces of charred material such as cereal grains and their chaff.

The final factor is that the processing of the cereals known to be significant in this region does not include the opportunity for preservation via charring.

The aim of this study is to consider the last point; in particular that of the processing of finger millet, and whether this crop is in fact exposed to heat during processing. The chance to observe traditional finger millet harvesting and processing in Uganda arose during the 1997 field season. The recording of this cycle is thought to be important; not only by helping to understand more about the possible causes for the apparent lack of plant remains on East African sites, but also because there is little published ethnobotanical work relating to finger millet processing, and none from East Africa itself.

Previous ethnobotanical work on finger millet

The use and importance of understanding the processes, products and by-products of cereal crop processing has been demonstrated by the work of Hillman and Jones in Turkey and Greece respectively (Hillman 1984; Jones 1984). Through the description and analysis of each stage of harvesting and processing, a clear picture of the materials and remains resulting from each stage can be built up, which is then transferred to interpretations of recovered archaeobotanical assemblages. However, the studies undertaken by Hillman and Jones deal primarily with temperate crops such as wheat and barley. Ethnographic studies of the crops collectively known as "the millets", usually *Sorghum bicolor, Eleusine coracana, Panicum miliare, Pennisetum typhoides*, and in some regions *Setaria italica*, are almost unknown. Reddy (1991, 1997) has initiated studies of the millets in south Asia, and is applying models developed from ethnographic studies of crop husbandry to two Late Harappan (second millennium B.C.) sites in Gujurat, India. In these models and their interpretations, Reddy stresses the role of weeds (when present) and the products and by-products of crop processing for understanding the archaeological agricultural regimes. D'Andrea et al. (1997) have begun work in the Ethiopian highlands, looking at the activities, products and by-products of cereal (including finger millet) and legume agriculture. In addition, this work aims to analyse the role of gender within the traditional farming communities studied, aiming to further understand the implications this has for social and economic organisation and development. The preliminary observations only have been published so far. However, in East Africa, where both sorghum and finger millet were, and often still are of great importance, no other palaeoethnobotanical work has been carried out to date.

By investigating the stages, tools and results of finger millet harvesting and processing, it is intended to provide a record of traditional methods, and also to determine whether the cereals are exposed to heat, and are therefore exposed to potential charring at any stage or stages. If they are, then this obviously will have an effect on the sort of predictions made about the likelihood of crops entering the archaeological record.

Munsa 1995

Fieldwork at the Iron Age site of Munsa in south western Uganda had two significant outcomes that have a bearing on this work. First, there were no identifiable plant remains other than wood charcoal recovered, despite an extensive sampling and retrieval programme (Young 1996; Robertshaw 1997). Second, interviews confirmed that millet had been of importance in this area for as far back as the interviewees could account for, and that it was no longer grown in the locale of modern Munsa due to the popularity of newer crops such as potatoes, although sorghum was grown as a single field crop.

Kasunga 1997

Fieldwork in 1997 took place at Kasunga, some 10 km from Munsa, with a different cereal crop pattern. Here, finger millet was a widespread crop, generally in fields of up to 3 acres (1.2 hectares), but sometimes larger, and sorghum was grown within compounds rather than fields, and the heads were picked casually when needed. Our field season spanned the finger millet harvesting period, thus providing an ideal opportunity to record it.

Finger millet harvesting and processing at Kasunga, Uganda

The cycle of finger millet begins and ends with clearing the previous crop remains, which can be done by burning fields at the end of the harvest, or removing dying plants

by hand, and then hoeing the ground in preparation for the next crop. This preparation of the field by removing old crops was designated women's work. Most of the farmers we spoke to around Kasunga said that they preferred to rotate crops on any piece of land: millet, sometimes with a little sorghum mixed in, followed by a season of beans (*Phaseolus vulgaris*) or groundnuts (*Arachis hypogea*), both of which are relatively recent introductions in this area. After the clearing and hoeing, finger millet seeds were scattered on the ground, covered with soil and left to germinate. When the plants reach a height of around 5 cm, weeding takes place. Weeding is a male task, and generally only occurs once, as millet is closely sown, dominating a field and tending to crowd out most weeds once it has taken hold.

Finger millet is planted in February and August, and harvested in June or July and then January. Harvesting is carried out by the women of a family group, sometimes with the assistance of neighbours, or other female relatives. Young boys can also help. Not all the field is necessarily harvested at any one time - hands damaged by birds, or those unripe, will be left and either harvested later, or left to drop of their own accord. Two women can harvest half an acre in three days. Each hand is cut separately, with approximately an inch or so of the stalk attached, and thus no weeds or grass are harvested with the cereal itself. Women carry out all of the post-harvest work.

Once harvested, whole hands of millet are spread out to dry in the sun, and this drying takes about a week - both sorghum and millet are stored in and around the house during drying. When the millet is thoroughly dry, a large wooden mortar and pestle is used to pound the hands and loosen the grains from the chaff. Following the initial pounding, using a basket tray and the wind, the chaff, straw and any other waste material is removed in the winnowing process.

The hulled grains are then roasted, continually being moved over an open fire. This softens the grains and loosens the small and persistent pieces of chaff. Further winnowing and roasting then takes place, to ensure the removal of as much waste material and soften the grains as much as possible. The final processing stage is that of grinding the millet grains to make a powder or flour, which can then be mixed with another flour, such as cassava flour (a relatively new idea), or used on its own to make porridge.

Waste products from the processing were discarded, and in the compound where the whole process was observed, eaten by chickens. It seems that cereal wastes are not kept for food for other animals, or used for fuel or other purposes.

Summary of the ethnobotanical activities as they relate to archaeobotanical assemblages

This outline of traditional finger millet processing in East Africa shows that these cereal grains, and some of the waste products, are exposed to fire at least once prior to final cooking. Although the potential dangers of extending ethnographic work to archaeological situations have been widely explored (for example, Binford 1972; Hodder 1992), the value of heating millet cereals during processing was clear, and the opportunity for crops to enter the archaeological record through charring is thus thought to be a distinct possibility.

Further, aspects of the harvesting and processing cycle may affect the composition of the archaeological assemblage. As Reddy observed in finger millet processing in south Asia, since only the inflorescence is cut (unlike harvesting methods for wheat and barley (Hillman 1984; Jones 1984)), weed seeds will not be included, thus losing indicators of the processing stage (Reddy 1997). Also, rachis remains in millet are far more fragile than in wheat and barley, so are less likely to survive in archaeological situations - perhaps particularly in conditions of repeated wetting and drying, as in the humid tropics.

Conclusion

In conclusion, the value of developing crop processing models from ethnobotanical work to assist in interpreting archaeobotanical assemblages is now well known (Hillman 1984; Jones 1984; Reddy 1997). Whether the crops in question are the wheat and barley of temperate regions, or the millets from south Asia and Africa, such work is now regarded as an important analytical tool. However, such ethnobotanical work can also be seen to be of great assistance in helping to address other archaeobotanical questions, such as exploring a range of reasons for the widespread absence of plant remains on East African sites. It is now necessary to look at both other reasons for this lack of recovered plant material, and alternative methods of learning about the plant subsistence base in East Africa. As the work outlined above strongly suggests that finger millet in this region was exposed to heat and thus potential charring during traditional processing, it is clearly a possibility that if similar processing was occurring during prehistoric periods, then such evidence of finger millet cultivation and preparation could be preserved in archaeobotanical assemblages.

Acknowledgements: the author would like to thank the following funding bodies: the National Science Foundation of America; The British Academy and the University of Bradford, for their assistance in field work, research and enabling participation in the 11th Symposium of the IWGP in Toulouse, May 1998. The author would also like to thank Professor Pete Robertshaw and Dr Andrew Reid for their help in both Munsa and Kasunga, and Dr Jill Thompson for help in Bradford. To Mr Deziderio Ssettabi and his family, most grateful thanks for inviting us to his farm for a memorable Sunday of finger millet processing, and also to the many farmers around Munsa and Kasunga who shared their knowledge.

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