

KELLY REED AND IVAN DRNIĆ

IRON AGE DIET AT SISAK, CROATIA: ARCHAEOBOTANICAL EVIDENCE OF FOXTAIL MILLET (SETARIA ITALIC [L.] P. BEAUV.)

Summary. Recent excavations at Sisak, Croatia, unearthed an early Iron Age pot filled with archaeobotanical remains within the floor of a structure dating to between the 6th and 4th centuries BC. Burnt in-situ the archaeobotanical remains provide unique evidence for diet and agriculture in a region where archaeobotanical evidence is rare. The preliminary results from this analysis are outlined here with a focus on the discovery of foxtail millet (Setaria italica [L.] P. Beauv.) and its contribution to the diet of the early Iron Age population at Sisak.

INTRODUCTION

The prehistoric settlement in Sisak, located at the confluence of the Kupa, Sava, and Odra Rivers in central Croatia (Figure 1), was an important centre in the Iron Age due to its prominent position at the crossroads of the eastern Adriatic coast, northern Italy, the southeastern Alps, and the middle Danube region. Its prominent role as an exchange and production centre during the Iron Age continued into the Roman period, when at the end of the 1st century BC it was conquered by Octavian (Šašel Kos 2005). The settlement is mentioned by several ancient authors (e.g. Strabo, Cassius Dio) under the name of Segestika, Segesta and Siscia.

Although pre-Roman settlement in the area is known from classical texts, its extent is practically unknown from an archaeological perspective. Salvage excavations conducted over the last 10 years have begun to reveal pre-Roman occupation at Sisak, unearthing Iron Age layers under the Roman city on the left bank of the Kupa River (Drnić and Miletić 2014). Recent systematic excavations, conducted by the Archaeological Museum in Zagreb, began in 2012 on the right bank of the river and revealed early and late Iron Age cultural layers more than two meters thick. Interestingly, there were no traces of Roman occupation except for a few late Roman inhumation graves.

In trench 1, under a thick layer of house daub, the remains of an above-ground structure oriented NE – SW (Structure 1) were found (Figure 2). It consisted of a yellow clay floor, several

irregularly shaped rock fragments, and the remains of wooden beams made of oak (*Quercus* sect. *Quercus*). A thick layer of daub and a large amount of charcoal, together with burnt wooden architectural parts and clay floor, suggest that the structure was destroyed by fire. Some typical late Hallstatt pottery dates Structure 1 to between the end of the 6th and 4th centuries BC. In trench 2, 60 meters west of trench 1, the remains of two structures (Structures 2 and 3) from the same period and with the same architecture and orientation were excavated. These two structures are separated by a narrow lane – or possible street – oriented NW-SE. This conclusion was confirmed by a geomagnetic survey, suggesting a regular layout of the early Iron Age settlement.

On the surface of the floor in Structure 1 a pot full of charred plant remains was found (Figure 3). Its upper surface was exposed to the fire, changing its colour to red and black while its lower part remained a dark gray. It is a typical coarse pottery with a rounded body, short neck, and inverted rim (Figure 4). The pot was emptied and the soil examined for archaeobotanical remains. The preliminary results from this analysis are outlined here with a focus on the discovery of foxtail millet (*Setaria italica* [L.] P. Beauv.) and its contribution to the diet of the early Iron Age population at Sisak.

METHOD AND RESULTS

The content of the Iron Age pot was extracted, resulting in a sample of about 4 l. The sample was handsieved under gently running water using a 0.25mm mesh and air-dried. In order to assess whether any plant-macro-remains were in the sample a small sub-sample of 30ml was initially examined using a stereo zoom microscope (5-45x). Surprisingly the small sub-sample contained almost exclusively two millet species; broomcorn (*Panicum miliaceum* L.) and foxtail millet (*Setaria italica* [L.] P. Beauv.). The sample was so well preserved that even the glumes had survived and in some cases had fused together.

The foxtail millet grains measure approx. 1.2 (*h*) x 1.0 (*w*) mm, while the broomcorn millet was distinctly larger at approx. 1.5 (*h*) x 1.8 (*w*) mm. The foxtail millets have an oblong hilum, longer than wide, while the scutellum scar reaches to 2/3 of the length of the grain, with sides tapering towards an obtuse/acute end (Figure 5). Several grains were still encased within their glume and were distinct due to the ornamentation of pusticulae arranged in longitudinal rows. Five grains were identified as *Setaria viridis/verticillata* and although similarities exist between foxtail millet and the wild annual weeds *Setaria viridis* [L.] Beauv. and *Setaria verticillata* (L.) P. Beauv., the grains here were slightly smaller, more slender and oblong in shape than the foxtail millet grains. In contrast, the broomcorn millet grains were bigger and thicker with an almost

triangular scutellum reaching only half of the length of the grain. The glumes were also distinctly smooth and shiny.

Within the sub-sample 93% of the plant remains were identified as foxtail millet equalling approximately 10,020 grains, while only 7% of the sample was of broomcorn millet (Table 1). If the sub-sample is representative of the whole sample then the pot could have contained approximately 1,343,000 grains of foxtail millet along with 104,000 broomcorn millet grains.

TABLE 1
Plant remains from the sub-sample of sample 60, Iron Age Sisak

	Sample 60
Stratigraphic unit	105
Volume	30 ml
<i>Bromus</i> sp.	1
<i>Lolium</i> sp.	1
Gramineae (fragments)	3
<i>Panicum miliaceum</i>	780
<i>Setaria italica</i>	10,070
<i>Setaria viridis</i>	5

ARCHAEOBOTANICAL EVIDENCE OF FOXTAIL MILLET IN SOUTHEAST EUROPE

When and where broomcorn and foxtail millet first became established in Europe as a crop is still debated, so at present is it not possible to follow the expansion of foxtail millet cultivation, especially as the point of origin is still unknown. The disjointed distribution of these two species has resulted in several origin hypotheses based on either a single domestication point in northern China or eastern Europe followed by a rapid spread across the central Asian steppe, or multiple domestications across Eurasia (e.g. Jones 2004; Zohary et al. 2012, 71).

Summaries of the archaeobotanical evidence for broomcorn and foxtail millet have previously been published by Lisitsyna (1984), Wasylikowa et al. (1991), Marinval (1992); Nenci (1999); Jones (2004), Hunt et al. (2008), Zohary et al. (2012), Bakels (2013) and Motuzaite-Matuzeviciute et al. (2013). Typically, low concentrations of millet have been interpreted as 'weeds', whereas higher concentrations have been designated as a 'crop plant'. However,

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difficulty in the identification of foxtail millet from its wild relatives has also led to a certain amount of ambiguity over when foxtail millet was first cultivated as a crop in Europe. Generally, the archaeobotanical evidence shows that the quantity and frequency of foxtail and broomcorn millet increases across Europe by the Iron Age.

In Croatia, both broomcorn and foxtail millet have been identified at Bronze and Iron Age sites, but in small quantities (Reed 2013; Nye 1996). In Serbia, the first large deposits of broomcorn millet seeds are seen during the late Bronze/early Iron Age at Feudvar, Gomolava, Gradina-on-Bosut, Hisar and Kalakača (Kroll 1998; van Zeist 2001/2002; Filipović 2011; Medović 2011, 2012). On the other hand, foxtail millet is recovered in very low numbers and may represent a weed within the fields of broomcorn millet (van Zeist 2001/2002). This pattern is also seen in Hungary, where very little foxtail millet has been identified (Gyulai 2010). Further south in Greece, broomcorn millet is believed to have been introduced to the northern part by the end of the 3rd century BC and was established widely as a crop during the late Bronze Age (Valamoti 2013). Its introduction coincides with the introduction of the horse and it is suggested that millet may have been introduced to Greece from contact with horse breeding cultures from the northern Steppes (*ibid.*). But again few records of foxtail millet as a crop have been identified in this region.

In Austria, evidence of both broomcorn and foxtail millet stores at Himmelreich, Siebeneich and Ganglegg confirm the importance of millets as a crop in the Iron Age (Schmidl et al. 2007). Other archaeobotanical evidence north of the Alps towards western Europe has also shown that foxtail millet become established as a minor crop by the Iron Age (Bakels 2013).

MILLET CONSUMPTION IN IRON AGE CROATIA

The archaeobotanical sample from Sisak strongly suggests a crop store of foxtail millet. The purity of the deposit, with no remains of the straw or rachis and few weedy species, would suggest that the grains had been stored after threshing, sieving and winnowing (see Reddy 1997; 2003; Harvey and Fuller 2005; Moreno-Larrazabal et al. 2015 for millet processing). The recovery of grains still within their glumes suggests that the grains were not dehusked before storage. Studies have shown that the glumes protect the grain against humidity, fungi and insects during storage (Sigaut 1988; Meurers-Balke and Lüning 1992). The grains could then be dehusked piecemeal, possibly within the home, before consumption. The relatively small proportion of broomcorn millet within the sample may suggest that it was a weed within the main foxtail millet crop and only remained through the sieving process due to its similar shape and size.

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Millet is fast growing and so requires a shorter growing season than other cereals, resulting in its use as a summer crop in crop rotation systems in the past (e.g. Harding 1989; Jones 1987; Spurr 1983). Millet is also a good famine crop, due to its adaptability to different environments, being particularly drought resistant (Jones et al. 2011; Bakels 2012). Even the ancient author Strabo (5.1.12) advised, 'millet is the greatest preventive of famine, since it withstands every unfavourable weather and can never fail, even though there be scarcity of every other grain'. Though, it is worth noting from a recent ethnographic study in the Iberian Peninsula that dry, hot summers reduce the size of foxtail millet grains considerably, whereas wetter, cooler summers result in a higher yielding crop (Moreno-Larrazabal et al. 2015).

The consumption of millet would have been affected by cultural traditions and taste and only ethnographic observations and ancient accounts may suggest how it would have been processed and consumed in prehistory. For example, in Asia millet is treated similarly to rice where the outer bran of the grain is removed before boiling (Weber and Fuller 2008). In Galicia, Portugal, broomcorn millet is used as a kind of porridge made with either whole grains or millet flour boiled with milk or water (Moreno-Larrazabal et al. 2015). During the Roman period millet was made into bread, eaten as porridge and was even thought to have medicinal properties (Murphy 2015).

Knowledge regarding the nature of agriculture during the Iron Age in Croatia is currently limited to two sites, Kaptol-Gradici (Hršak 2009) and Nadin-Gradina (Nye 1996), where emmer and spelt wheat, along with six-row barley and to a lesser extent broomcorn millet were identified. In the Carpathian Basin a similar cereal spectra exists suggesting a focus on the cultivation of emmer, spelt and barley, although variation exists between the settlements (cf. Gyulai 2010: 142-148). Thus, the discovery of a store of foxtail millet at Sisak raises a number of questions regarding agricultural production at the site, including the extent to which foxtail millet contributed to the local diet.

The extent to which millet may have contributed to the diet of populations in Croatia has recently been examined through the examination of carbon and nitrogen stable isotopes of human bones excavated from Bronze and Iron Age sites within Croatia. In particular, Lightfoot et al. (2014) found that individuals from Iron Age Vinkovci-Nama (continental Croatia) showed a clear C4 signal indicating that millet was a notable part of the diet. In addition, social differentiation was suggested from burials within the Iron Age coastal site of Nadin-Gradina, where individuals buried in simple pits showed higher levels of millet within the diet than those buried in stone-lined graves, implying that millet was a low status food at this site (*ibid.*). However, within the rest of Europe, isotopic evidence for millet consumption is rare with only a handful of individuals

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from Greece, Italy and Slovenia showing that millet was included in the diet, whether consumed in its own right or ingested from animals that had been fed on millet (Lightfoot et al. 2013).

CONCLUSION

The recent excavations at Sisak unearthed unique archaeobotanical evidence of foxtail millet dating to the early Iron Age. The purity of the remains and its recovery within a pot suggests the storage of a crop for human consumption. Due to the unique nature of this find in southeast Europe, it is difficult to determine the extent of its cultivation at the site, whether its cultivation was distinct to the region and why it may have been grown (e.g. as a famine crop, personal tastes etc.). Further research is therefore needed to explore the nature and extent of foxtail millet as a crop and its contribution to diet and subsistence in prehistory.

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ILLUSTRATIONS

Figure 1: Location of Sisak, Croatia

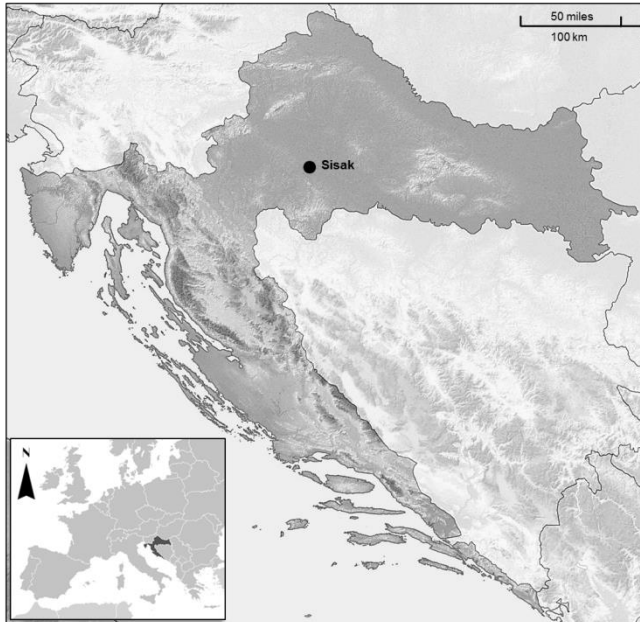


Figure 2: Sisak: Structure 1 with the late Iron Age pot in-situ (circled in black) (photograph by author)



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Figure 3: Sisak: the late Iron Age pot in-situ within Structure 1 (photograph by author)

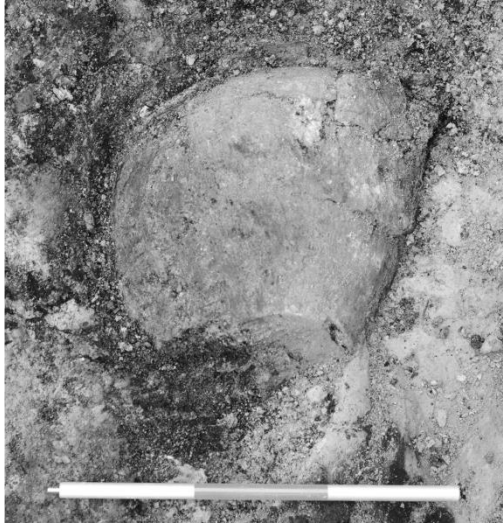
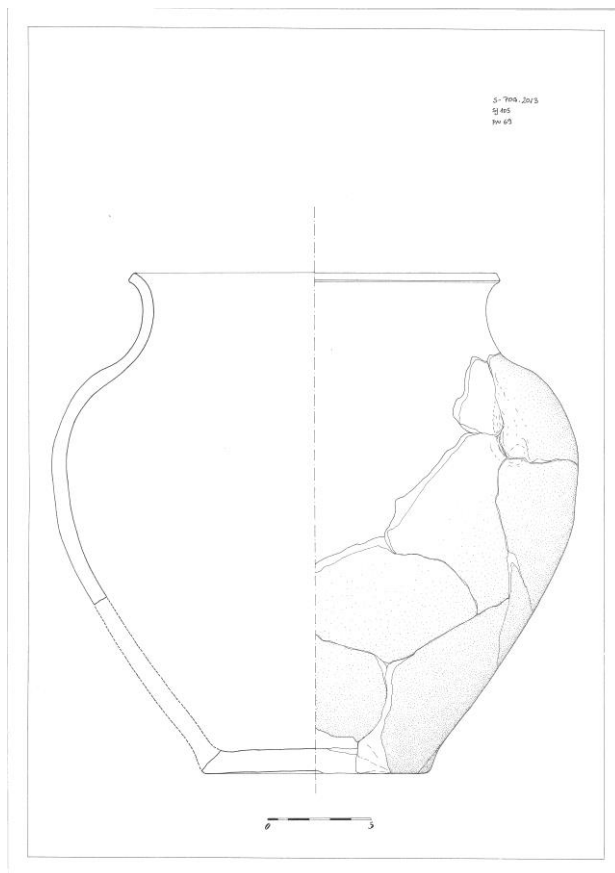


Figure 4: Sisak: illustration of the late Iron Age pot from Structure 1 (drawn by Anita Ivanković)



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Figure 5: Sisak: Grain of foxtail millet from the late Iron Age pot in Structure 1 (scale = 1 mm)
(photograph by author)

